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Fifteen cents a copy
Three dollars a year

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Champion Dependable Spark Plugs

Severe Air-Test Shows Dependability of Spark Plugs With No. 3450 Insulator

Champion ⅞-18
Price $1.00

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Champion Spark Plug Company, Toledo, Ohio
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THE MOTOR TRUCK BOOK OF

The Chicago Tribune

THE WORLD'S GREATEST NEWSPAPER

These few charts are typical of the many found in an extraordinary treatise on merchandising motor trucks in the Chicago Territory prepared by The *Chicago Tribune*. This book is unique in that it does not deal with how to use motor trucks, nor how to build motor trucks, but is confined to solving the problem of how to *sell* motor trucks, particularly in the Chicago Territory.

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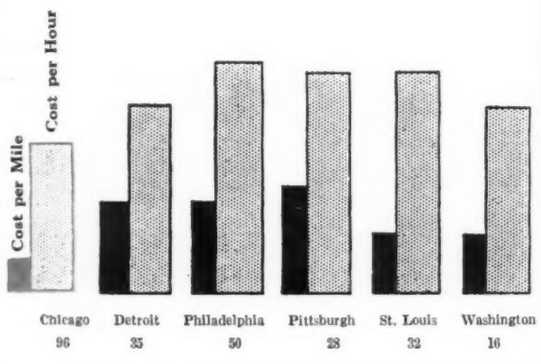
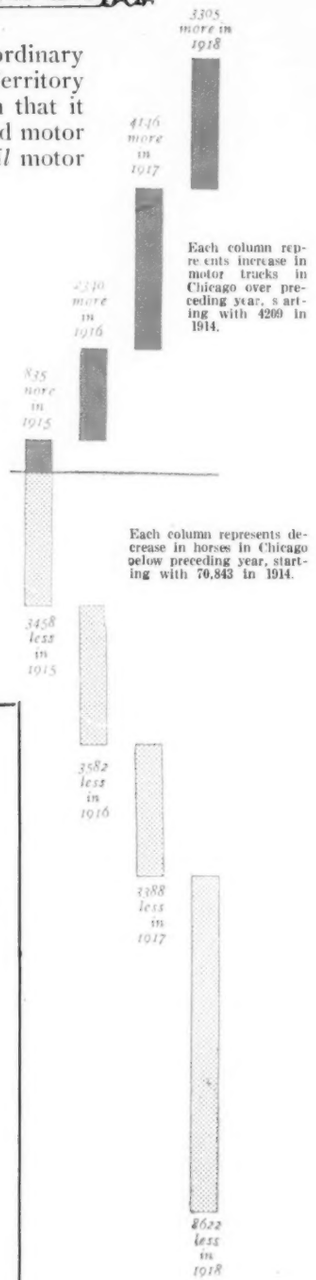
Cost of Operation of 750-lb. Post Office Motor Trucks:

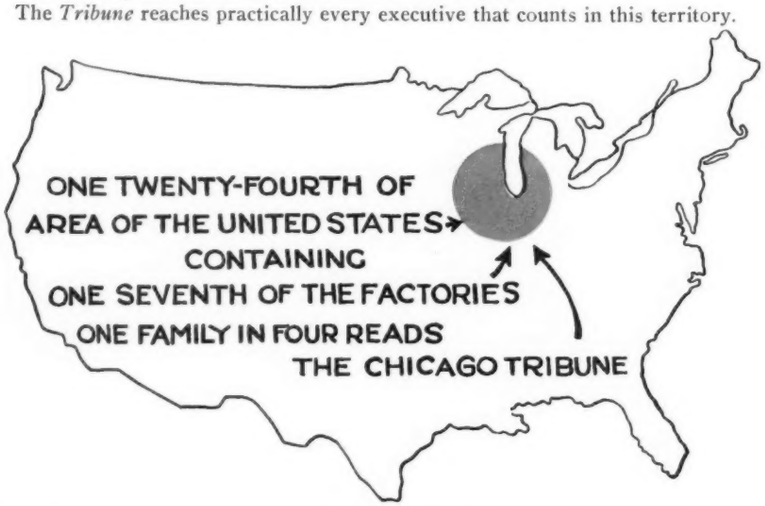



3305 more in 1918
4136 more in 1917
2330 more in 1916
835 more in 1915
Each column represents increase in motor trucks in Chicago over preceding year, starting with 4269 in 1914.
3458 less in 1915
3582 less in 1916
3388 less in 1917
8622 less in 1918
Each column represents decrease in horses in Chicago below preceding year, starting with 70,843 in 1914.

Do You Sell Trucks to Factories?

In the zone shown in black are 80 cities of more than 10,000 population which had in 1910 more than 20,757 factories. The *Chicago Tribune* reaches one out of every two and one-half families in these 80 cities.

The *Tribune* reaches practically every executive that counts in this territory.



Use the Power and Prestige of The Chicago Tribune To Dominate The Richest Market in the World

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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International Air Navigation Regulations

Paris Commission Adopts Preliminary Code — Will Be Basis for Final International Rules — Recognizes Rights of Individual Countries

By Allen Sinsheimer

WASHINGTON, April 7—The first comprehensive attempt to formulate an international code controlling aërial navigation has been completed by an inter-ministerial commission at Paris, appointed for this purpose. The first copy of these regulations has just been received in this country and is printed herewith.

Following a brief explanation of the past history of the attempts to formulate navigation regulations, the code comprises fourteen articles, with a number of annexes and programs.

Primarily, the code is intended to regulate navigation throughout the world, although for the time being and until the peace treaty is signed only the Allies and the United States are recognized.

Neutral countries will be allowed to join after peace terms are completed, and at that time the attitude toward Germany and other enemy countries will be decided. The right of each individual nation to formulate individual aërial regulations is recognized in so far as these regulations do not conflict with the international code.

The work of the commission was quite complete, and the general scheme includes provisions covering practically all of the more important problems of civil aviation. In order to secure permission to fly over the territory of any other country, an aviator must be registered in one of the nations recognized by the code, must possess a flying license, and the pilot of the machine must be a citizen of one of the recognized countries.

The airship must be provided with a route-book, corresponding to a ship's log, in which the nature of the airship, register number, name, nationality and residence of the owner and pilot, crew, passengers, complete details of the trips, memorandum of transported merchandise and route incidents must be recorded.

Any of the recognized countries may forbid private individuals to fly over certain zones of its territory. The carrying of cameras, war appliances or any dangerous explosives is forbidden except when specially authorized.

Military planes are not allowed to fly over foreign territory.

All the recognized countries are to agree to provide assistance to any airship when it is needed, and especially to build landing fields. Tariff, hygiene and landing-field regulations are to be determined by the individual countries.

Technical conferences are to be held at which representatives of at least two-thirds of the recognized countries will be present and at which additional provisions and modifications of these provi-

sions will be suggested for the final draft of the international code, which will be valid in every contracting country and which cannot be renounced until 3 years after notice is given.

The airships of each country will be lettered to denote their nationality and type of ship, and these letters must be displayed prominently.

Licenses will be granted after sufficient trials before competent aeronautics associations or in the presence of public authorities. In this particular provision there is opportunity for misuse of the regulations, inasmuch as it can become possible for an aeronautic association, by this authority, completely to control aeronautics in its particular country.

Furthermore, the navigation license must include complete and intimate data relative to each airship, and any rules which will allow a private aeronautics association to possess such information in its files also allows for further abuse.

Certificates of competency are to be provided each pilot and engineer of an airship by the country to which he belongs.

Detailed regulations regarding the use and placing of lights, driving, signals and use of ballast are given.

Motor-driven airships must give right of way to all other ships, including free balloons and dirigibles, according to the regulations, which apparently means that airplanes must allow right of way to balloons and dirigibles. A distance of 200 meters must be maintained between airships whenever possible; when they are closer than this, special regulations are provided for their operation.

Pilots' tests include flights for 1 hour at an altitude of at least 2000 meters, descent in a volplane with the engine shut off, flying around posts, landing with the engine completely stopped when the airplane touches the ground or water, endurance tests and written or verbal technical examinations. Pilots must have theoretical knowledge regarding air resistance, the functions of the various mechanisms, fitting up of planes, aërial navigation rules, complete engine construction, and must be versed in climatic conditions and map-reading.

Following is the report, including the code of the Inter-Ministerial Commission of Civil Aeronautics at Paris:

Regulations for Air Navigation

Inter-Ministerial Commission of Civil Aeronautics

THE end of the war is opening new vistas to civil aeronautics. A large number of machines and pilots given back to pacific activity are ready to develop air locomotion in all its forms, in Belgium, France, Great Britain, Italy and the United States. Aeroplanes or even dirigibles will certainly be precious help for touring, trade, public services, etc.

Great Britain, fearing to lose her privileges as an island, did not seem at first to welcome the invention, but she has become now much interested in the development of air navigation. France, which was the seat of the first international conference, which in 1910 attempted to solve the difficult judicial problem, must on her behalf and that of other nations resume the work which she so successfully started 8 years ago. Such a task has been assigned to her by decision of the Inter-Allied Parliament held in London last November. In 1910 Great Britain's hesitation had caused the conference to be postponed with no other result than an unsigned project of international convention; but to-day Great Britain's opposition has ceased. The 1910 text, too carefully detailed, can be given a shorter form. Moreover, at that time lack of experience prevented certain regulations from being settled; but to-day the necessary modifications can be made.

In 1910 four powers which are now the enemies of France were present at the conference, along with Denmark, Netherlands, Sweden, Switzerland. There is no question of treating the first four like the five others and the neutrals like Belgium, Great Britain, Italy, Portugal, Roumania and Serbia; the reciprocal freedom of navigation can only be granted with full confidence to the States which alone, from war to victory, have drawn their bonds closer. The European allied nations represented at the 1910 conference, and the United States of America alone, will be invited to exchange their views from which, on the morrow of victory, the first great conventional law of the air will spring. Later on neutrals can join. Then peace negotiations will decide in what degree it may be extended to the various enemies.

It is, therefore, in this spirit that the Inter-Ministerial Commission of Civil Aeronautics, which had not waited for the armistice to anticipate and examine the question, drew up the following project of convention, to be taken as a basis for an exchange of views, in Paris, between the European Allies and American associates.

Project of International Convention Regarding Air Navigation (1)

Article I

Airships owned by citizens of one of the contracting States alone, answering the following conditions, are authorized to fly over the territories of the contracting States:

It is necessary:

1—To be duly registered in one of the contracting States, according to Regulation, Annex A.

2—To possess a flying license, according to Regulation, Annex B.

3—To be driven by nationals of one of the contracting States and be provided with technical certificates and licenses, according to prescriptions of Regulations, Annex C.

The original, or an authentic copy, of each of these documents must always be kept on board and presented at any requisition.

Article II

The airship must have a routebook along with a list of the transported persons, goods and objects, drawn up according to the prescriptions of Regulations, Annex D.

Article III

Each State is allowed to forbid private individuals, no matter what their nationality, and under the penalties referred to in its regulations, to fly over certain zones of its territory; previous notice is given to the other contracting parties.

Article IV

It is forbidden to carry, without special authorization, camera, war appliances or ammunitions, as well as any other dangerous explosives.

(1) The project was unanimously adopted in the meeting of Nov. 13, 1918.

Article V

Except if especially authorized, the military airships of a contracting State are not allowed to fly over the territory of the other contracting States.

Article VI

In case of war, the stipulations of the present convention do not affect the liberty of action of the contracting States, either as belligerents or as neutrals toward belligerents.

Article VII

The navigation must be effected according to the Regulations, Annex E.

Article VIII

The contracting States undertake to assure all measures with a view of giving airships the necessary help when landing, especially in case of breakdown.

Article IX

The present Convention does not affect the special regulations of the contracting States as long as they stand outside its clauses.

Special agreements settle the conditions relative to customs, stations, hygiene, etc.

Article X

The present Convention applies to all colonies, possessions or protectorates.

Article XI

Third parties will be authorized to adhere to the present Convention on condition the contracting States unanimously grant their consent.

Article XII

The present Convention will be put into force at the same time as the exchange of ratifications, which will take place within 6 months at the latest.

These ratifications will be deposited at the archives of the French Foreign Office.

Article XIII

Technical conferences which will be held at the request of at least the two-thirds of the contracting States will proceed to the examination of the modifications to be made in the regulations added to the present Convention.

Article XIV

The present Convention cannot be denounced before the expiration of a 3-years' delay, dating from its signature.

The denunciation only concerns the State which notifies it and 1 year after.

Annex A

Conditions of Registering

The name, surname, nationality and residence of the owner and constructor will be entered in a register.

The registering, inscribed in Roman types, will include:

I—The capital letters (one or several) characteristic of the owner's nationality, indicated as follows:

BELGIUM, *B;* UNITED STATES, *US;* FRANCE, *F;* GREAT BRITAIN, *GB;* ITALY, *I;* PORTUGAL, *P;* RUMANIA, *R;* SERBIA, *SB.*

II—The small letters, characteristic of the nature of the airship: a, for aeroplanes; b, for free balloons; d, for dirigibles.

III—The figures and letters of the record number of the airship in the register.

Everything according to the following model: "*USa*101*G*"

The letters and figures representing the registering indication of the airship must be at least 45 centimeters high. Their width must be two-thirds of their height and their thickness the sixth of their height. They must be printed in black on a white background and placed:

For *a dirigible or balloon:* On the top part of the balloon, under the car, and on both vertical sides of the car.

For *an aeroplane:* Above the upper wing, under the lower wing and on both sides of the helm or on each of the outer parts of the helms.

The States must send to one another the list of their registering through the medium of the French Government.

Annex B

Navigation License

The navigation license will only be granted after sufficient trials effected in the presence of a public authority or competent aeronautics association belonging to one of the contracting States.

This navigation license will include the following indications: Name or firm and residence of the constructor; place and year of manufacture; number or any other identity indication given to the machine by the constructor; characteristics of the airship.

The latter must be the following:

For free balloons:

1—Dimensions of the envelope (diameter, circumference, volume).
2—Diameter of the orifice of the appendage.
3—Nature of the envelope.
4—Disposition of the driving and inflating orifices.
5—Weight of the envelope, net and car.

For dirigibles:

1—Regarding the envelope: Its model and chief dimensions.
2—Regarding the car: Number, dimensions, places.
3—Regarding motors: Number, model, diameter of cylinders, length of pistons, normal power and consumption.
4—Regarding tanks: Number, specification, volume.
5—Regarding propellers: Nature, number, places, diameters.
6—Regarding helms of directions: Disposition, nature, number and places.
7—Regarding empennage: Disposition, number, places.
8—Necessary crew for the driving of the balloon.

For aeroplanes:

1—Model of the machine.
2—Sustenation surfaces, number, dimensions.
3—Motors.
4—Tanks.
5—Propellers.
6—Helms.
7—Empennage.
8—Landing disposition.
9—Fitting.
} Same as for dirigibles.
10—Necessary weight (fuel, accessories and crew being deducted); that is, available weight for passengers and goods.
11—Speed, horizontal at 1000 meters altitude.
12—Time of ascent (empty and with full load) at 1000, 2000, 3000 meters, etc.
13—Ceiling (empty, full load).
14—Necessary crew to drive the airship.

Any modification made in the machine must be declared to the competent administration. The visits made by public authorities, with a view to examining the navigation conditions of airships, must be mentioned in the certificate, along with repairs and modifications.

Annex C

Certificate of Competency

Each of the members, pilot, engineer, or any other specialist of the driving crew of an airship must be provided with a special certificate of competency according to the enclosed model, delivered after theoretical and practical examinations by the competent authorities of the State he belongs to.

This certificate bears the names, surnames, nationality, birth date and place, photograph and signature of the owner, who must be at least 18 years old.

The present program of the examinations is as follows:
(See *Regulation of the Aviator Pilot's Certificate.*)

Annex D

Routebook

The routebook, according to the enclosed model, must contain the following indications:

Nature of the airship, registering number, name, surname, nationality and residence of the owner.

Moreover, for each journey: Name, nationality and residence of the pilot, crew and passengers; the place, date, time of departure and route incidents (landing, accidents, etc.)

The list or memorandum of the transported goods must be added to the book if necessary.

Annex E

AIR TRAFFIC REGULATIONS

Regulation Regarding Lights

Article I—The regulations regarding lights must be observed, no matter the weather, from sunrise to sunset. In the meantime, an airship must not show any light liable to be mistaken for a regular light.

The use of flashlight is forbidden except for landing.

Article II—Motor airships must carry the following lights, the radius of visibility of which is determined in relation to the vertical plan P of longitudinal symmetry of the airship, when the latter is in a horizontally rectilinear position of flight:

a—In the forepart, a white light placed in the plan P, visible in a dihedral with vertical faces, each forming a 110-deg. angle with P, according to the following:

b—In the back part, a white light placed in the plan P, visible in a dihedral with vertical faces, each forming a 70-deg. angle with P, according to the sketch.

c—On the right, a green light visible in a dihedral with vertical faces, respectively, forming 0-deg. and 110-deg. angles with P, according to the sketch.

d—On the left, a red light, visible in a dihedral symmetrical with the preceding one.

e—The faces of these four dihedrals must be provided with vertical screens so that the light cannot be seen in the obscure field of the dihedral.

f—The white light in front must be visible at a distance of at least 4 kilometers, the white light behind and the green and red lights at a distance of at least 2 kilometers, in a dark night, with no mist.

g—The lights must not be screened in any part of the illuminated field. To this effect, each light must be duplicated so that the couple of lights yield the regular dihedral of visibility above and under the airship.

However, regarding dirigibles, the lights need not be visible in the upper sheet of the cone of revolution, the generatrixes of which are inclined by 60 on the vertical.

Article III—Free balloons must have a ready white light, of at least 2 kilometers range; this light must be pulled up at the approach of another airship.

Route and Drive Regulations

Article IV—Motor airships must always keep away from free balloons and dirigibles when the latter carry signals similar to those of free balloons.

Article V—A motor airship must always keep away from any other airship at a distance of at least 200 meters, and drive according to regulations referred to in Articles VI and VII, as soon as it is aware that the distance is getter shorter.

When airships are less than 200 meters in depth away from one another, they must drive as if they were at the same altitude, according to the following regulations:

Article VI—a—In the case of two airships going in the same direction, the one which is behind, when the quickest, must drive so as to keep away from the other. It must not get beyond the other by diving but by flying over, on condition that it can keep away at a distance of at least 200 kilometers.

If it wants to get beyond without flying over, it must pass by on the left.

b—When two airships are going crossing directions, the one which sees the other on its right must drive so as to keep away, avoiding to cross in front of the other. As to the latter, if it thinks necessary to move, it must do so, so as to increase the space between both airships.

c—When two airships are going in opposite directions, they must both keep to the left.

Article VII—The airship which is going a free way and wants to turn around on the left must not do so unless it is sure that it is not followed by another airship at a distance less than 200 meters. In case it cannot get sure of it, it must turn on the left within at least a 500-meter radius.

Article VIII—When a dirigible voluntarily stops, it must pull down, five meters under the car, a black ball, of a diameter at least one meter. In that case it remains submitted to the same regulations as moving airships.

If it cannot control its movements, it must show another black ball, two meters lower than the first one, and is then like a free balloon.

In both cases, at night, it lights its white lights only, and is similar to free balloons.

Article IX—Airships must use, under the circumstances mentioned further on, phonic signals emitting three kinds of calls, according to schemes A, B, C.

Scheme A—Short sounds of 3 sec. at intervals of 3 sec. These calls must be heard in all kinds of weather: fog, mist, snow or heavy rains.

Scheme B—Alternatively short sounds of 3 sec. and long sounds of 9 sec. at intervals of 3 sec. These calls must be emitted by airships on the point of landing.

Scheme C—Long sounds of 9 sec. at intervals of 3 sec. These calls must be emitted, if possible, by airships in distress.

Distress Signals

Article X—Besides phonic signals, according to Scheme C, dirigibles and free balloons must observe the following prescriptions, as much as possible, in case of distress above land as above sea:

a—In the day time, dirigibles must place a triangular red flag under the car, and show the two black balls referred to in Article VIII.

In the night time, they must show and wave a white light, and put out their side lights.

b—A free balloon must hoist a triangular red flag under the car in the day time and show a white light at night.

Use of Ballast

Article XI—It is forbidden to use other ballast than fine sand or water.

Regulation of the Aviator Pilot's Certificate (Public Transport)

Practical Tests

Tests of Height and Volplane—Fly without landing for one hour at least and keep up at an altitude of at least 2000 meters above the starting point.

The descent must end in a volplane, motor shut off. This volplane must begin 500 meters at least above the landing ground. The landing must be effected at a distance of 200 meters from a point fixed beforehand by the commissaries controlling the test, without restarting the motor.

Handling Test—Fly without landing around two posts (or buoys) situated at a 500-meter distance from one another, effecting an interrupted series of figures of eight, each loop of which must alternately include one of the two posts (or buoys). This flight must be effected at an altitude of 200 meters above the ground, without touching the soil or water, on a distance of at least 5 kilometers long, the distance counted for each figure of eight being that between the two posts (or buoys).

Landing must be effected according to the following indications:

1—Shut off the motor altogether at the latest when the aeroplane touches the ground or water.

2—Definitely stop the aeroplane at a 50-meter distance from a point designated by the candidate before the test.

Test of Endurance:

1—A triangular journey of 200 kilometers, the distance being counted according to the length of each side of the triangle, which must not be less than 20 kilometers. This journey must be effected on the same aeroplane within 24 hours, including two compulsory landings fixed by the commissaries. Landing must be effected on the grounds of departure at least one hour after sunset and one hour before sunrise.

2—A journey without stopping, of at least 50 kilometers, in a straight direction, effected with the same machine, and on the same day, between sunrise and sunset.

This test includes a distance of at least 100 kilometers at an altitude over 1500 meters.

After having completed the satisfactory practical tests,

the candidate must undergo, after convocation, two examinations, one on aeroplanes and driving, the other on motors, according to the program given herewith.

Observations

The delivery of the certificate is optional. The candidate will be on board in each practical test.

Practical tests must be effected within six months from the first to the last test.

They can take place in any order and be started again once each.

The departures, stoppages and landings will be verified by two competent controlling commissaries, who will send to the authorities the reports drawn up in the form required. These reports must indicate the various incidents, especially regarding landing.

The candidate must furnish, at the beginning of each test, unquestionable identity papers, which must be presented to the commissaries.

Registering barometers must be sealed by the commissaries, who will tell the candidate that he must carry out the test so that the line 0 of the diagram, before and after landing, be clear enough and especially sufficiently prolonged after the arrival, and that the diagram be absolutely legible. The commissaries will refuse graduated barometers above 1000 meters.

The diagram of each test must be taken off by one of the commissaries, who will make sure that the graduation of the sheet corresponds to the altitude indicated by the plate fixed on the barometer case. The diagram, signed by both commissaries, will be added to their report.

The pilots provided with the military certificate of aviator pilot will also be granted the pilot's certificate for public transports.

As to private people, the pilot's certificates delivered by the Aero Club, along with the military certificate, will amount to a driving license.

Program of the Knowledge Required by the Candidate for Aviator Pilot's Certificate

I—Aeroplanes

Summary theoretical knowledge regarding the resistance of air applied to aeroplanes, helms and propellers.

Function of the various organs and the handling thereof.

Fitting up of aeroplanes, propellers, landing gear, helms and handling thereof.

Air traffic regulations.

II—Motors

Generalities on sparking engines and rotation at four speeds.

Study of the various functions of the motor; distribution, carburetion, lighting, escape.

Characteristics of aviation motors.

Ideals on regulating, function of the steering-wheel, equilibrage.

Generalities on the constitution, construction, regulating and putting engine in a proper condition.

Causes of the bad working of motors.

Ideas on spirits and oils.

Detailed description of the aviation motor used.

Regulating, driving, greasing, upkeep, taking to pieces and putting together of the chief organs with the means on board.

Finding out the causes of breakdowns.

III

Practical knowledge of the special conditions of air journeys; care to be taken in cold weather, at high altitudes. rain, fog.

Reading of the map, direction, etc.

"The Consulting Engineer"

By R. A. C.

THE writer notes with pleasure the excellent editorial entitled "The Consulting Engineer," appearing in the March 6 issue of AUTOMOTIVE INDUSTRIES and wishes to express his appreciation and at the same time compliment the editor for the efficient and able manner in which the subject was handled and presented.

The writer could cite many instances of where great financial losses were caused through the unwillingness of not only the plant engineer but the business management as well, to call in a consulting engineer.

It seems to be the opinion of most manufacturers that consulting engineers are over-technical, fussy and impractical, and are only useful after something has gone wrong, thus interfering with the production, operation or sale of the commodity manufactured. The writer has attended the last rites of a number of concerns that put off calling in a consulting engineer until it became evident that what was needed was a referee in bankruptcy instead.

The most economical time to call in a consulting engineer is in the beginning, before the new design is made. If called in at that time, a good broad visioned, well informed consulting engineer becomes a dividend paying investment in that he not only instructs the plant engineer and the business management as to the best method of procedure but, most important, he advises them as to what not to do.

To be successful in the consulting engineering profession, it is necessary for an engineer to be very broad visioned and intensely practical, and he must have commercial ability so as to be able to quickly determine the commercial value of new ideas or suggestions offered and at the same time be able to point out the practical limitations of theory in design.

The more capable and efficient the plant engineer is, the more willing he is to have a consulting engineer called in, as he soon discovers that the value of his services to his employer are materially increased by the assistance given him by the consulting engineer and finally regards him as a real friend to whom he can go for assistance when difficult problems present themselves, without feeling that his own value has been lowered in the estimation of his employer.

Aircraft Yearbook

A YEARBOOK for the year 1919 has just been issued by the Manufacturers' Aircraft Association, Inc., New York City. It is virtually a record of what the members of this association accomplished during the past year. The book has been compiled by a committee of the Association, Fay L. Faurote acting as editor. According to the preface, the Annual is intended also to constitute, in some measure, a history of aviation, both industrial and scientific, and a repository of aeronautical information.

After an introductory chapter on the future of aviation, there follows a short article on the history of the Manufacturers' Association. Then follow articles on the different companies forming the membership of the association, giving their histories, their personnel and a description of the product they are turning out. It is stated that the facts for this record were obtained through the co-operation of the individual companies.

The remainder of the book contains a list of Government organizations having to do with aircraft development, a list of the world's aces, a history of the early period of aviation, and a chronology of important events in connection with heavier-than-air flying machines; also articles on "Aerial Mail To-day and To-morrow," "The Weather Bureau and Aviation," "Balloons," "Important Events in Balloon History," "Mapping of Aerial Routes," "Landing Fields" and "How Can Men Fly?", a list of air service stations, designation of aeroplanes, a list of books on aeronautics, and a list of aeronautical magazines.

Worm Gear Efficiency

Description of a Test Rigging for Determining the Efficiency of Worm and Wheel Rear Axle Drives—Some of the Results Obtained in the Tests

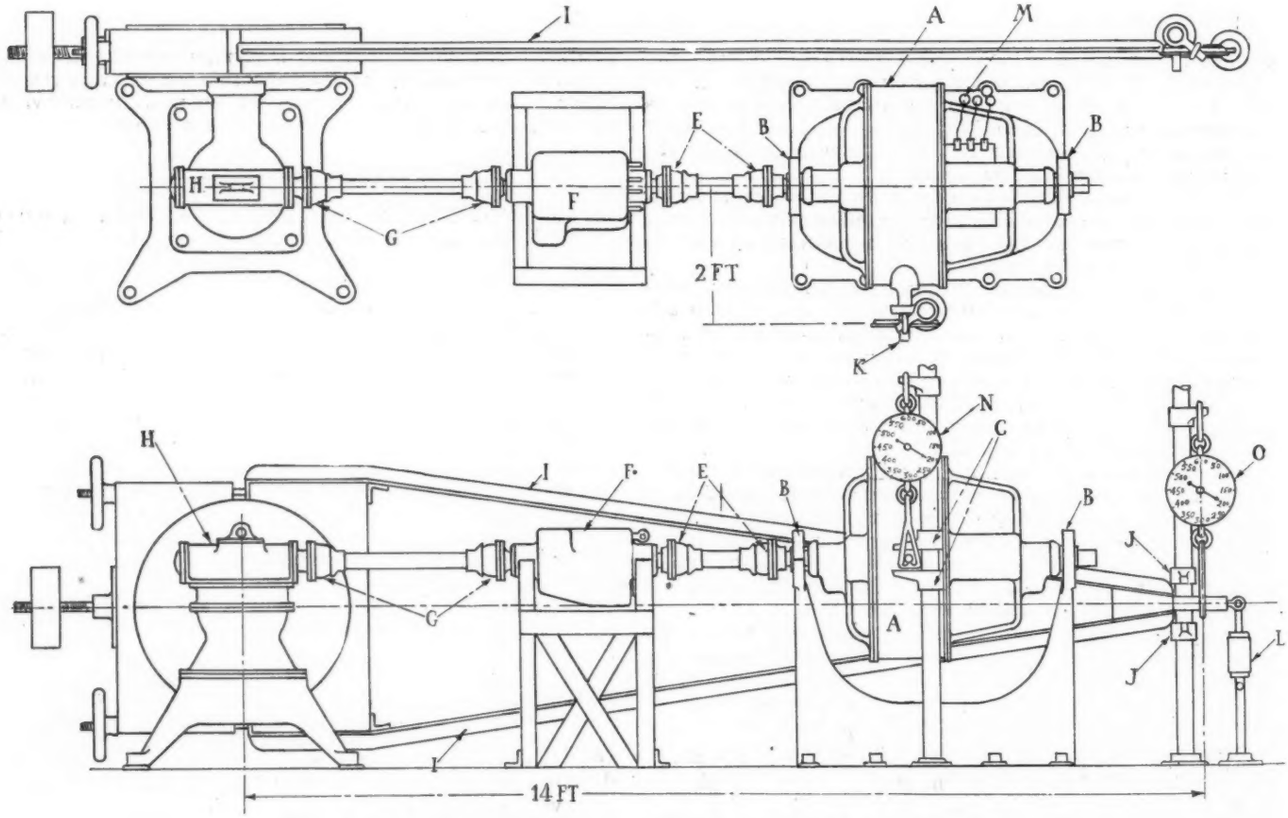
By C. H. Calkins

MUCH confusion exists regarding the actual mechanical efficiency of worm gears. The zealous gear salesman and the academic treatise tell us that their efficiency is 99 per cent, or better, and the shop man, who is not familiar with modern worm gears, denies that their efficiency is better than 60 per cent.

It should, in the beginning, be realized that more advance in the theory and practice of worm gear manufacture has been made in the past 8 or 10 years than perhaps in the previous 50 years. Until recently worm gears with leads of from 3 to 6 in., such as are now common on automobile rear axles, were rarely seen. Grinding the teeth of a worm was unheard of, and little was known of correct tooth shapes and angles or their relation to efficiency and reversibility. Still less was known of the relation of various steels and bronzes to efficiency and durability. Even at the present time few brass foundries are able to produce a gear bronze which is properly cast and chilled to enable it to meet the high requirements of the modern worm wheel. Every foundry thinks it is easy to do this, but the writer has found by bitter experience that only those foundries which have specialized on this work and which have had long experience are able to produce desirable results.

It was with a view to clearing up some of this uncertainty regarding worm gear efficiency and to demonstrate to themselves what a modern high-grade worm gear could do that the Baush Machine Tool Company, of Springfield, Mass., worm gear specialists, and a truck manufacturer jointly undertook to obtain some accurate, authentic efficiency data. The truck company was not only interested in obtaining worm gear data, but wanted to know the total power loss from engine to rear wheel; consequently tests were made covering the truck gear box or transmission losses, together with the rear axle worm gears. Worm gears alone were also tested.

The Baush Machine Tool Company had previously built a small efficiency machine suitable for testing gears up to 5 or 6 hp., so this experience was brought to bear on the design of a larger machine, which was finally completed in the summer of 1917, as shown below. The tests described below were made at the Baush Company's plant by representatives of the truck company and the Baush company, and were made solely with the



Plan and elevation of the Baush company's worm wheel testing stand

idea of obtaining information, and the results have never been used in an advertising way.

Referring to the drawing, *A* represents a 230-volt, 32-hp. motor with a speed variation of from 300 to 1200 r.p.m. The fields are mounted on ball bearings indicated at *B*. This leaves the fields free to oscillate a short distance limited by the stops *C*. The armature shaft is extended by means of two universal joints *E* to truck transmission *F*. This transmission and the universal joint are regular standard equipment as used on the truck company's 3-ton truck. The transmission has 4 speeds and is ball bearing throughout, the construction being of the very highest grade. The armature shaft is continued by means of two more universal joints *G* to a standard worm gear housing *H*. The worm wheel shaft, which in a truck would correspond to the rear axle drive shaft, is extended on one side only, and carries the drum of a prony brake. This shaft is mounted on ball bearings. The prony brake is of cast iron, 8 in. wide by 36 in. in diameter, and is hollow to admit the introduction of water for cooling purposes. It carries two heavy wooden brake shoes, which are adjustable by means of hand wheels. These brake shoes are extended into a 14-ft. lever *I*, the oscillation of which is controlled by stops *J*. Both the prony brake arm and the 2-ft. armature arm *X* are very accurately counterbalanced by means of adjustable weights, and the longer arm is held from vibration by a dash pot *L*, the piston of which is included in the balancing adjustment. The motor leads are extended by means of rigid terminals into mercury cups *M*, so that any error which might be due to the weight of the leads is obviated. The spring balances shown at *N* and *O* are the standard product of John Chattilon & Sons, and register up to 600 lb. The whole machine is rigidly mounted so as to reduce vibration to a minimum. The temperature of the oil bath, in which the worm gears ran, was taken by means of a calibrated thermometer which dips directly in the oil.

The results below are the average of a great number of tests, the idea in this paper being to set before the reader only net results. Before each test the brake and motor field balance were verified before witnesses, as in fact were all readings.

Several makes of worm gears were tested, but in this paper we will consider only those made by the Baush company. Also three bronze mixtures were tried, and it was found that mixtures had considerable influence on durability, and, consequently, efficiency. Whitmore's No. 45 oil was used in the transmission throughout all the tests and 600 W. Steam oil was used in the worm gear housing.

The ratio tested was 3:27, which gives a reduction of 9 to 1. The centers were 7.721 in. The normal angle of the worm tooth was 55 deg., the lead angle, 26 deg. 27 min. 8 sec. The circular pitch of the wheel was 1.468 in. The worm pitch diameter was 2.819 in. The worm was made of a low-carbon carbonizing steel, the analysis being approximately as follows:

Carbon	0.16 to 0.23
Manganese	1.00 to 1.2
Sulphur	0.045 to 0.06
Phosphorus	0.045 to 0.06

The worm teeth were carbonized, hardened, ground and polished.

The worm wheel was made of a bronze of the following mixture:

Copper	89 per cent
Tin	11 per cent

The casting was poured in a graphite mold so that the periphery to a distance of perhaps ½ in. was chilled. The Brinell test was 107 points.

Both worm and wheel were the regular product of the Baush company, selected at random from regular production.

Referring again to the drawing, it will be noted that the distance from the center of the armature to the end of the motor field arm is 2 ft., while the distance from the center of the prony brake to the end of the arm is 14 ft. In some of the tests the brake arm was 9 ft. in length, but in order to get the desired torque and still be within the capacity of the motor, it was necessary to lengthen it. The final results are not affected thereby.

The formulæ used were as follows:

$$\text{Efficiency} = \frac{\text{Brake pull} \times \text{length of brake arm } l \text{ (9 or 14 ft.)}}{\text{Motor pull} \times 2 \text{ ft.} \times \text{total reduction}}$$

$$\text{Horsepower input} = \frac{\text{Torque on motor fields} \times 2 \text{ ft. radius} \times \text{R.P.M. of motor}}{5252}$$

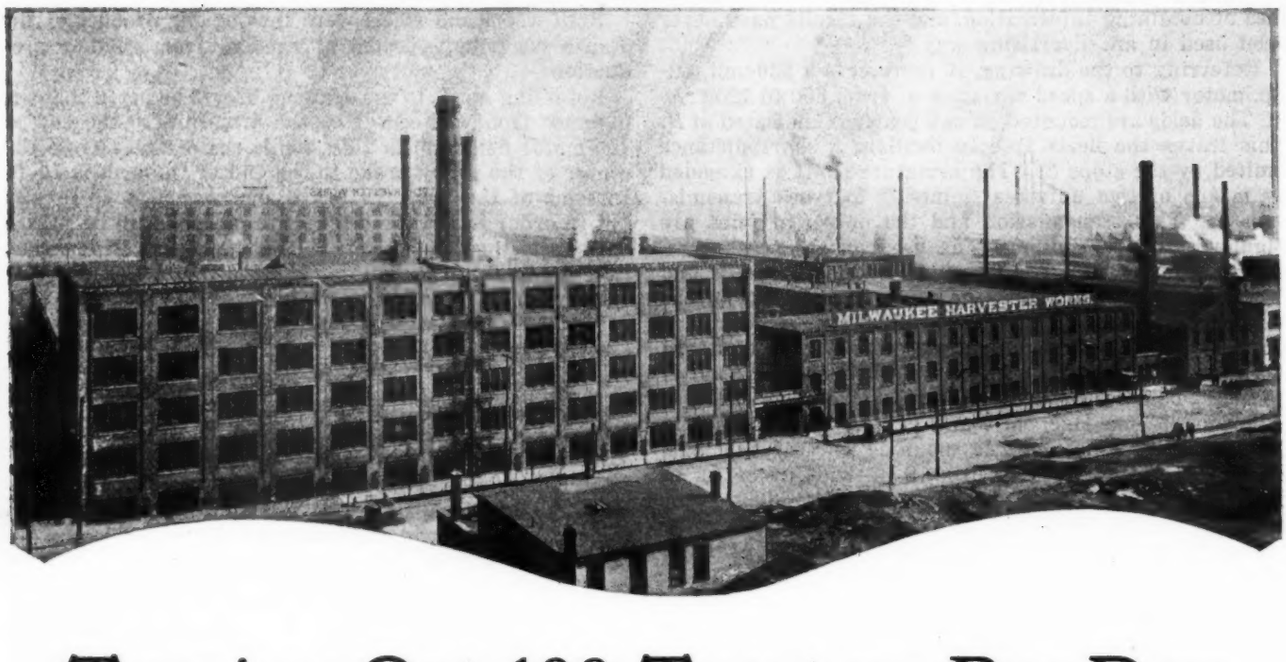
It will be noted that in using this machine the indicated efficiency is lower on account of losses in transmission, ball bearings, universal joints, worm bearings and oil splash. However, it is believed that these losses are very small.

SUMMARY OF TESTS

Test	R.P.M. of Motor	Motor Torque at 2 Ft. Radius in Lb.	Brake Torque in Lb.	Oil Bath Temp.	H.P. Input	Efficiency, per Cent	Remarks
1	800	104	187 lbs. at 9 ft. radius	186	31.68	89.9	Direct drive through transmission.
2	800	103.5	265.3 at 9 ft. radius	189	31.53	86.34	In third speed through transmission. Total reduction, 13.36.
3	800	103.4	296.2 at 14 ft. radius	185	31.5	86.8	In second speed of transmission. Total reduction, 23.1.
4	800	103.9	528.7 at 14 ft. radius	184	31.65	86.2	In transmission low speed. Total reduction, 41.3.
5	800	52	95 at 9 ft. radius	185	15.84	91.3	Direct drive. Transmission removed entirely.

It is realized that these efficiency values are not excessively high. They are, however, actual and are duplicated under actual working commercial conditions with all the gear products of the Baush company and trucks of the truck company. It is realized, too, that the subject might be treated in a more academic way and the tests might be made more scientifically and much more exhaustively. Indeed, the tests were actually made at speeds varying from the lowest to the highest truck speeds, but the results showed so little variation that they are not considered here. These speeds corresponded to an engine variation of from 280 to 950 r.p.m. It is undoubtedly true that if worm speeds—or, to speak more accurately, rubbing velocities—were greatly increased or decreased above these speeds, there would be a falling off in efficiency. Also, when the load per square inch on the teeth exceeds a certain value there is a power loss. The converse of this is also true. The efficiency of a worm gear depends in a very large measure on the fact that a film of oil always exists between the teeth, separating them and rendering metal contact impossible. The fact of this separation has been proven electrically.

It may be asked why, if the teeth touch only oil and not metal, they ever wear out. They do not wear very much. An automobile worm gear properly installed and cared for need never be replaced. By care is meant that there must always be plenty of oil and it must be changed occasionally, as dirt or chip particles set up at once a destructive wear and the oil may become a very fair abrasive. Also, the supporting bearings on the worm and wheel should be of such size that correct alignment is always maintained.



Turning Out 100 Tractors Per Day

Production System Employed at the Milwaukee Plant of the International Harvester Co.—Details of Machining and Assembling Methods

By P. M. Heldt

THE International Harvester Co., one of the oldest firms in the farm tractor field, is at present manufacturing four different tractor models, of which one, the Titan 10-20, is made completely in the Milwaukee works. Only four parts used on this tractor are purchased from outside concerns, namely, the mechanical oiler, the magneto, the chains and the spark plugs, every other part being made on the spot. The plant covers a site of 37 acres and employs in the neighborhood of 5000 men. Not all of the ground is covered by buildings, but every bit of it is used for one purpose or another, as the yards and spaces between buildings are stocked with raw material, parts in process of manufacture or completed machines. At the present time the plant runs on a schedule of 100 tractors a day, but this is constantly exceeded and the actual daily production is generally from 106 to 108 machines. Not all of the plant is devoted to tractor work, however, as farm engines and cream separators are also being made, but tractor production absorbs from 75 to 80 per cent of the entire capacity. The International Harvester Co. has been manufacturing tractors for 10 years, and the Titan 10-20 model has been turned out without important changes for about three years, so the concern has had time to fully develop its production methods.

One of the most important departments in a plant of this kind is the iron foundry with its subsidiary departments, represented by the core room, pattern storage vault and chipping room. The foundry of the Milwaukee plant of the International Harvester Co. is 148 ft. wide by 779 ft. long. Its location with respect to the other departments of the plant is shown by the accompanying general plan. In this department of the works, including the core room and shipping department, about 1100 men are employed. An idea of the capacity of the foundry may be gained from the fact that on March 5 last 360 tons of iron were poured, and during the month of January 7777 tons.

The company takes particular pride in its new core room, which has been in full use only about eight months. The basement under this room serves for sand storage. It is about 25 ft. high, and the sand is brought into it by means of 3 belt conveyors under the ceiling. The sand is shoved off the belt by means of deflectors or boards extending at an angle across it. Back of the sand storage room there is a passage with a number of openings in the wall, through which sand of the different grades can be withdrawn even when the room is practically full. The openings are closed by slightly inclined planks, which slip into grooves in the door frame. These prevent the sand from sliding out through the openings, and can be readily removed one at a time.

In making the core mixture, all of the materials used are dumped into a hopper, whence they are elevated by means of a bucket elevator, from which the mixture drops into another hopper, which feeds it into a revolving screen. This screen is of ½-in. mesh, and all the material that does not pass through this screen is separated out. This material is not thrown away, however, but is ground, and is then fed into the hopper again. Directly below the screen there is a mixer with agitator arms. While the dry materials entering the mixture, including the sand and rosin, are conveyed to the mixer by the elevator, oil is fed into it directly. The mixer delivers the core mixture to an elevator below it, which carries it into the core room upstairs. There are two of these power mixers.

Ordinarily core sand is used only once, but on account of war conditions and the restrictions on means of transport, the International Harvester Company breaks up all its old cores, grinds the material up in a machine with manganese steel rollers, mires it with fresh oil, sand and rosin and uses it over.

The furnaces for heating the core ovens are located in the basement, and the heat is carried up to the ovens through a large flue. A pyrometer of the indicating type, so arranged that it can be connected with any of the thermo-couples in the 32 furnaces, is located on the wall and can be made to instantly show the temperature of any of the ovens. The core

racks are made of angle steel and tubing. They are so designed that an electric industrial truck can be driven under them and then raise the rack by means of a power lift about 3 in. off the floor. When the core maker has completed a core, he places it on a rack behind him, and as soon as the rack is full along comes an electric truck and takes it away. About one-third of the workers in the core room are women, who do all of the lighter work. The core makers work on benches, and above these benches there is a runway along which the sand is moved by means of wheelbarrows. Over the bench of each core maker there are two hoppers, for two grades of sand. Only metal core boxes are used, and at the present time core making machinery is being installed. An underground passage connects the core room with the foundry.

Unloading Pig Iron

All pig iron is unloaded from the cars into large outside bins, and scrap steel and iron are also loaded into bins in the yard. This material is handled by means of an electric traveling crane with electromagnet. The crane runs the whole length of the yard and has a capacity of 10 tons. The capacity of the magnet is 3000 lb. of pig iron or 1600 lb. of scrap iron. This crane deposits the pig iron and scrap iron on the charging platform for the cupolas outside of the building. On this charging platform the pig iron and scrap iron are loaded into dumping cars, which are dumped into the cupolas by means of air hoists. For unloading sand and coke from railroad cars, so called clam buckets are used in connection with the crane. Every bit of pig and scrap iron that goes into the cupolas is weighed. A track runs the whole length of the charging platform, with two scales on wheels upon it. The track is sunk below the level of the platform, to such a depth that the scale platform is level with the loading platform. The dumping cars are loaded outside the building, are pushed on to scales, and then are moved on toward the cupolas.

There are 6 cupolas in all, in 3 sets of two, but not more than four are ever in use at one time. This gives opportunity for making the necessary repairs, such as relining with fire brick. The usual charge consists of one half pig iron and one half scrap iron, but in one of the cupolas a special mixture with a higher percentage of pig iron is melted. Every time a change is made in the charge of the cupola, a test bar is taken and given to the chemist to analyze.

The foundry, as may be imagined from the dimensions given in the foregoing, is an immense structure, and has a craneway running its entire length, upon which there are three electrically operated cranes. In addition to this, there are eight wall cranes. All of the small work is done on a balcony, which is half the total width of the foundry.

In addition to the overhead traveling crane and the wall cranes, there is installed in the foundry a narrow gage railway on which heavy material can be moved with the least effort. Each group of men in the foundry is provided with an air hoist for lifting molds, patterns, and castings, and for use in pouring. The bigger molds are poured directly from the car ladles from the cranes, while hand ladles are used in pouring the smaller ones. In the medium heavy work each man is provided with an air hoist, so it is not necessary for him to wait for the crane to come around. All heavy molding is done by means of molding machines, in connection with which pneumatic tamping is used.

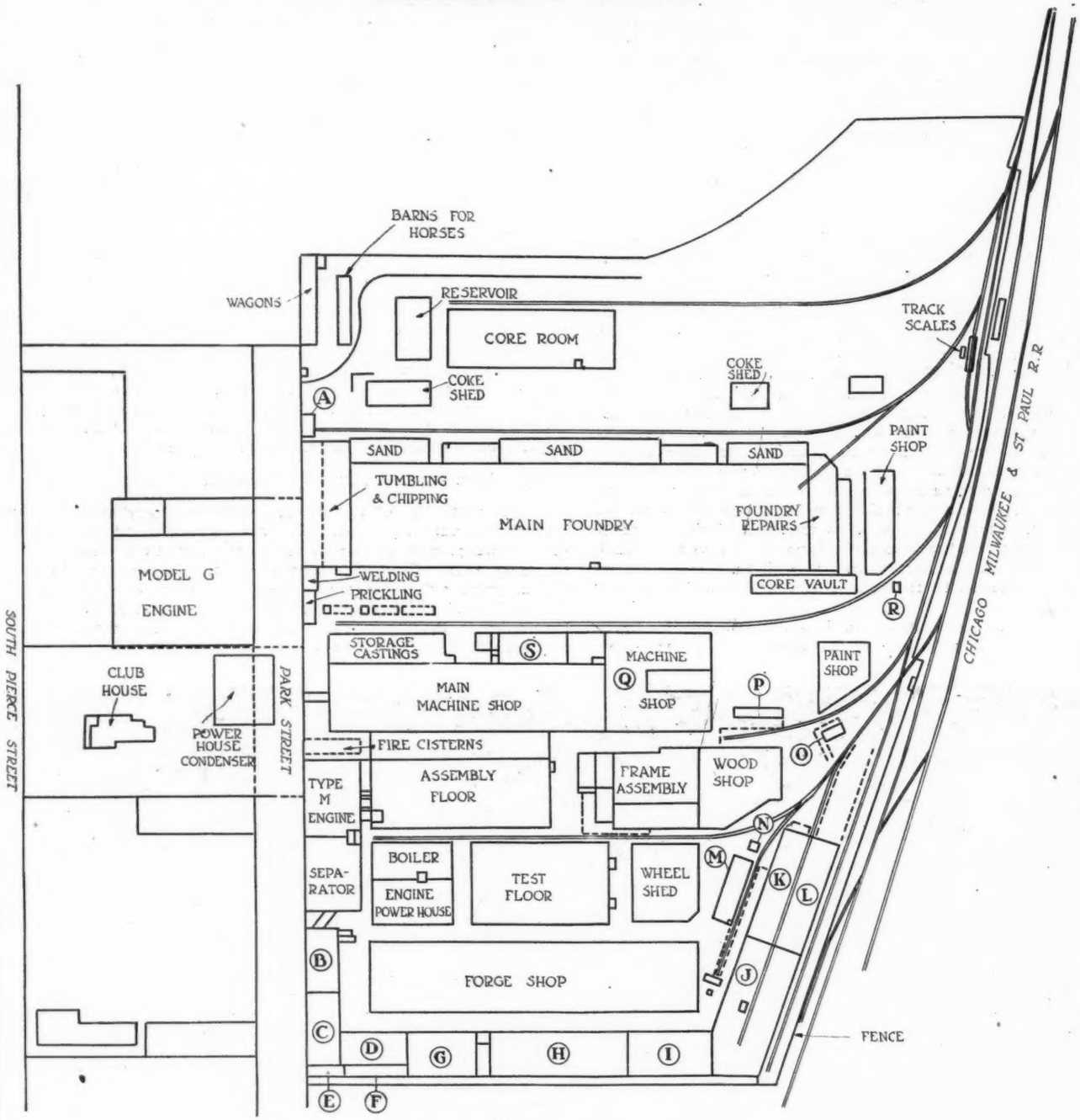
Up to the present all the chipping, tumbling and grinding has been done at one end of the foundry, in a mill room partly separated from it, but another mill room is now being installed at the opposite end, so the castings will not have to be transported the whole length of the foundry.

Repair Shop for Foundry Equipment

At the north end of the foundry there is a general repair shop for foundry equipment. All castings leaving the foundry are weighed on a scale at the point where they leave the tumbling room. They are also counted. Adjacent to the foundry repair shop there is a storage room for obsolete patterns. The Milwaukee plant of the International Harvester Co. began in 1906 to make farm engines. Many of the designs which have been produced in the plant since that time

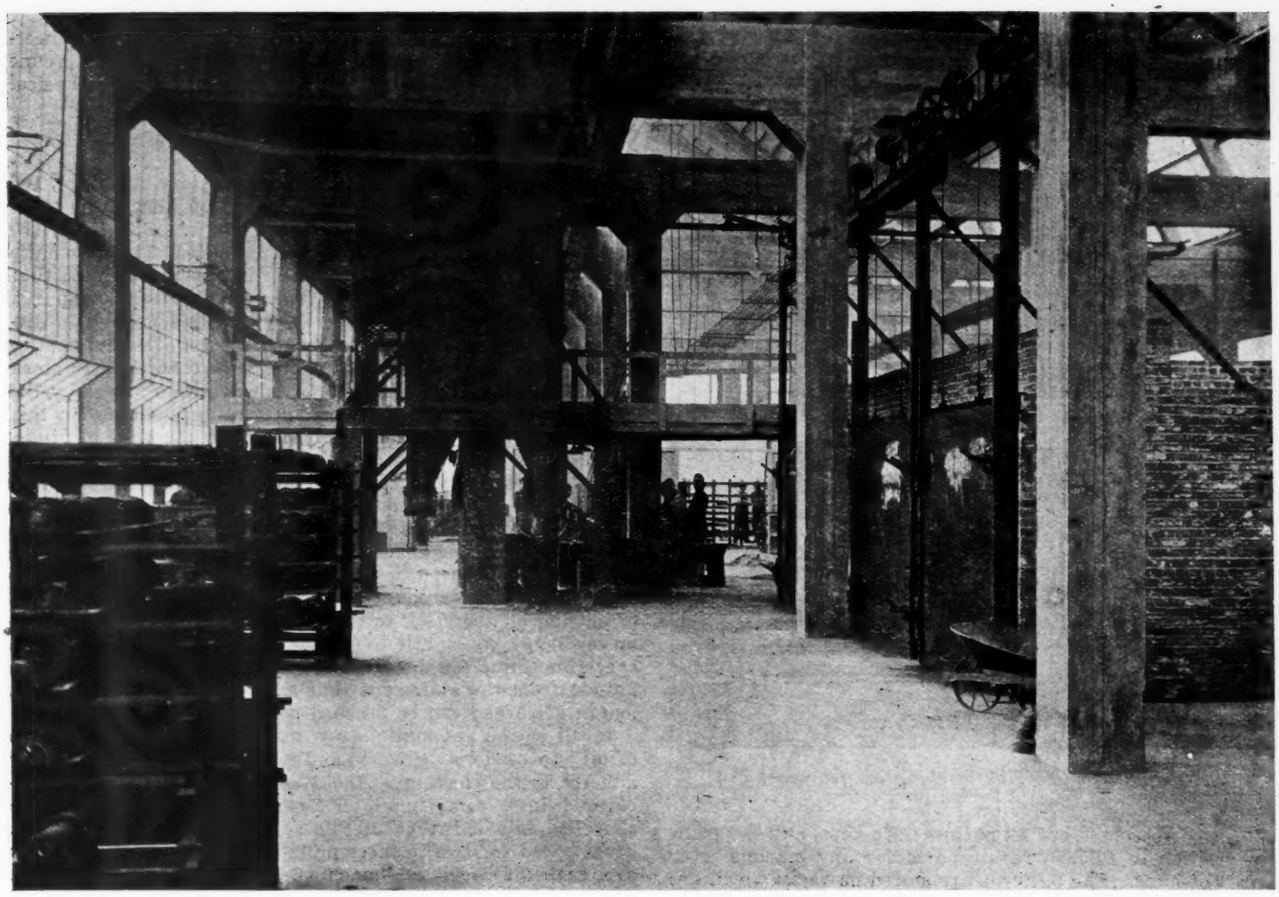
View in main machine shop of the International Harvester Co., where most of the heavy tools are located

Plan of International Harvester Milwaukee Works



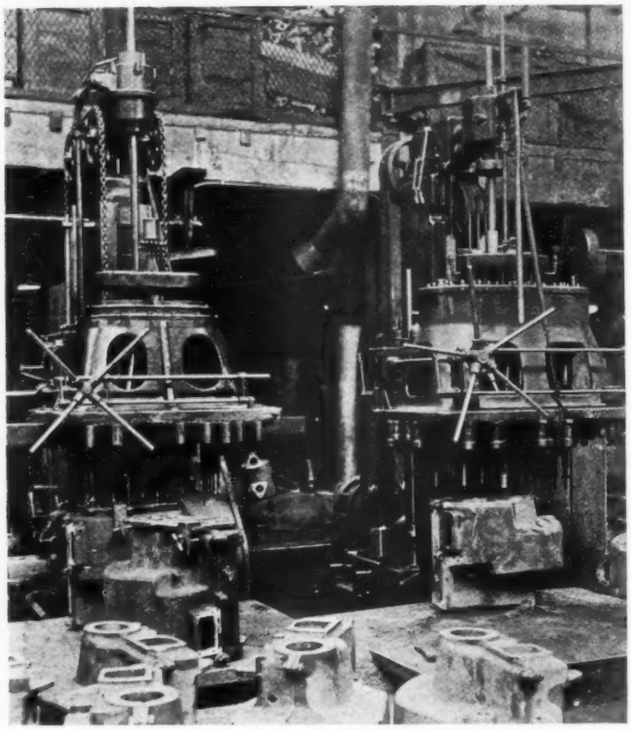
Key to Reference Letters

A, Elevator for refuse sand from tumbling room; B and C, Receiving Department and lunch room on main floor, Receiving Department and office on second floor, cream seperator erecting department on third floor; D and G, Tin Shop on first floor, office on second floor, cream separator painting and packing on third floor; G, Fourth floor wood patterns; H and I, First and second floors tin shop, third floor painting and packing, fourth floor metal patterns, painting and packing; J, K and L, Storage, shipping, repair and foreign packing (6 stories high); M, oil and paint storage and mixing; N, oil storage and pumps; O, shed for waste material; P, Receiving room for malleable castings; Q, Receiving department for bar steel, bolts, etc., in basement; R, Storage for excelsior packing; S, Wash rooms on first floor, brass foundry on second floor, carbonizing department on third floor



Core room, showing core racks at left, sand elevator in center and core oven on right

View in the foundry; even though it is Saturday afternoon, there is considerable "atmosphere"



Multiple spindle drills working on gear case

have become obsolete, but all patterns are kept, and the plant is in position to furnish repair parts for any machine ever turned out by it. The patterns are stored on racks which are lettered, and each shelf carries a number. A record is kept of all patterns and where they are stored, by means of which it is an easy matter to locate a pattern whenever it is required.

At the north end of the foundry there is a store room for current patterns. In the foundry only metal patterns are used, but all master wood patterns, from which the metal patterns were made, are preserved. The main foundry has a sawtooth roof, and is well lighted. For night illumination there are clusters of nitrogen lamps in the balcony, and single 800-watt nitrogen lamps in the main foundry.

The tumbling and chipping room is located at the south end of the main foundry. It is equipped with disk grinders which take off all the burs from the castings as they come from the molds. Every casting leaving the foundry is inspected, and all of the heavier castings are tumbled on the main floor.

Forge Shop

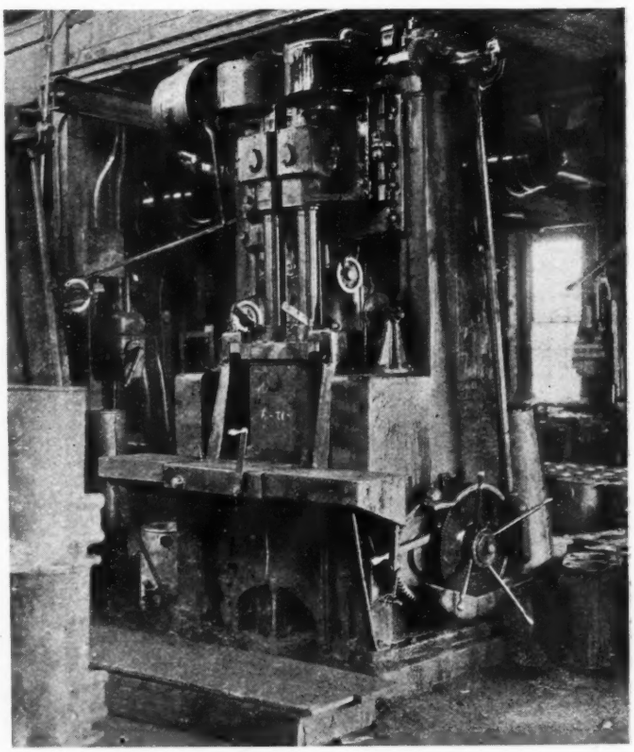
A department of almost equal importance as the foundry is the forge shop, which measures 101½ ft. in width by 474 ft. in length. All of the large ring gears employed in the Titan tractor are made from forged blanks which are forged in an upsetting machine or bulldozer. All material under 5 in. in diameter is sheared off cold. At one end of the forge shop the wheels are made. The rim material, cut to the right length and punched with the requisite number of holes, is delivered to the plant from outside. The first operation on the blanks is to roll them into circular form. Next the ends are riveted together and then the rims are assembled with the hubs and spokes, which is done in a jig. In joining the ends of the rims together, a couple of bolts are first put in and then the rivets are put in place, and headed by means of air riveters. In the forge shop a great many operations are being carried on, such as the forging of the front axles, gear blanks, crankshafts, connecting-rods, etc., but the equipment of drop hammers, steam hammers, bulldozers, etc., is the same as found in any large forge shop. Adjacent to the forge shop is the heat treating department in which both forgings and castings receive heat treatment. The piston castings, for instance, are annealed in order to relieve cooling strains. All forgings, such as the crankshaft, connecting-rods, etc., are submitted to a heat-treatment to refine their molecular structure, and thus to improve their physical properties.

Machine Shop

The machine shop comprises one single-story structure, 100 ft. wide by 392 ft. long, and at the end of same a six-story building in which most of the lighter work is done. On the upper floor of this six-story structure all of the automatic screw machines are installed. It is interesting to note that the company makes all of its taper pins and similar parts. It was noted that a color scheme of marking is used to distinguish steels of different carbon contents. The automatics are set in the usual way at an angle, so that the bar stock projecting from the head stock of one machine passes by the adjacent one. One of the most interesting machines in this department is an automatic for threading the ends of studs. These studs are used in considerable number for holding the engine cylinders, cylinder heads, etc. The studs, threaded on one end, are fed automatically through a hopper. A chuck clamps the threaded end and then a self-opening die cuts the thread on the other end. Then the die opens and a new stud entering the chuck pushes out the finished one. The first two operations on the studs, that of threading one end, and that of cutting off the stock to the right length, are performed in an ordinary automatic. An idea of the capacity of the special machine for threading the last end of the stud may be gained from the statement that six ½ in. studs with ¾ in. length of thread can be finished per minute.

In all of the automatic screw machines, a constant stream of oil is played on the work, and a great deal of oil naturally adheres to the shavings. About 90 per cent of this oil is recovered in a centrifugal oil separator. The shavings are shovelled into a basket in this separator, which is spun at great speed for two to three minutes, and when the shavings are removed from the machine, they feel absolutely dry. About 8 bbl. of oil is thus recovered each day. Sawdust is used on the factory floor below the automatics to soak up any oil that may leak from the machines.

(*To be continued*)

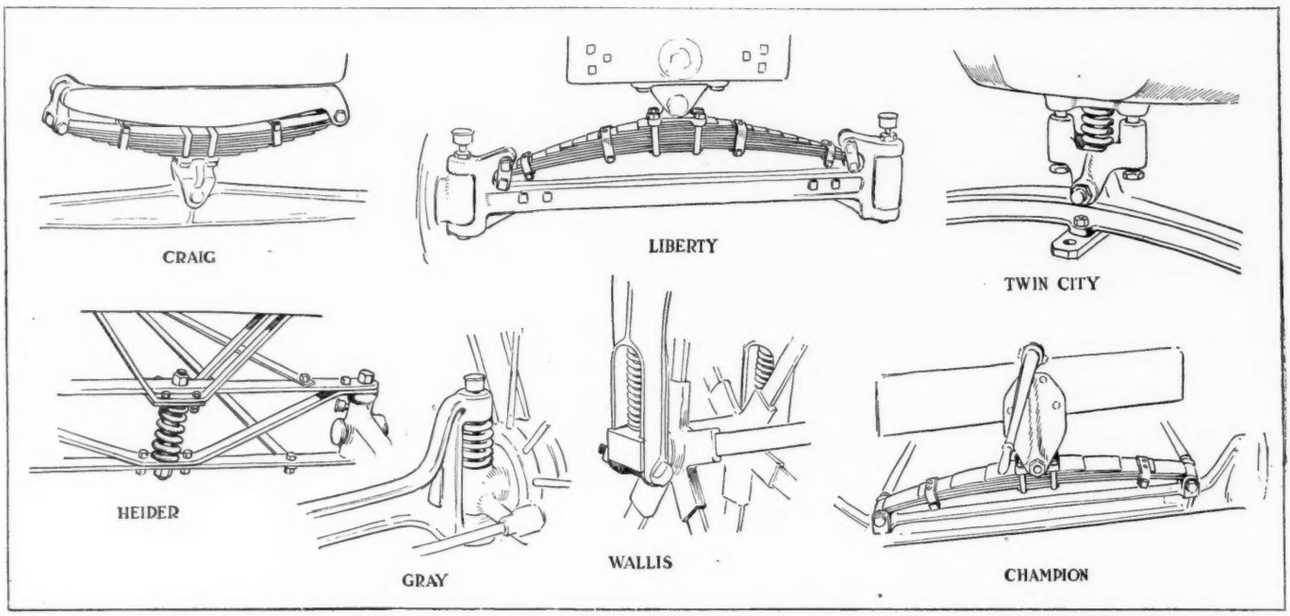


Boring cylinders in vertical boring mill at International Harvester plant

Spring Suspension of Tractors

Both Plate Springs and Coil Springs Used—Spring Suspension of Front End Fairly Common, of Rear End Rare—Sketches of Different Designs

By P. M. Heldt



The above sketches were made by an AUTOMOTIVE INDUSTRIES *artist at the recent Kansas City tractor show and include nearly all the front suspensions seen*

THERE are just two causes of wear and deterioration in tractors, the same as in other types of vehicles—friction and shock. Much has been done to minimize friction. Ball and roller bearings are being used more and more in tractor design, and lubrication means are also receiving close attention. But little has as yet been done to protect the mechanism against shock. It is true that when a tractor travels over soft ground it is really cushioned by the soil and does not require spring suspension to protect it. Whatever vibration may be caused by lack of balance of the engine would not be alleviated by springs but, on the contrary, would be rather aggravated thereby, because with spring suspension the mass on which these vibrating forces act would be cut down and the amplitude of vibration would be increased in proportion. The remedy for this sort of vibration has to be sought in careful balancing of the engine.

Tractors, however, often are required to travel over hard ground and sometimes even over stony roads. This causes a very severe vibration of every part, if no spring suspension is provided. The vibration is a good deal stronger than in a horse-drawn truck, for instance, as the truck usually has wheels of somewhat larger diameter and the wooden wheel absorbs most of the high-frequency, low-amplitude vibration.

Vibration is detrimental in that it tends to loosen joints and to crystallize the material of the parts chiefly affected by it. The force of the shocks produced when a moving vehicle strikes an ordinary road obstacle is greatly reduced by spring suspension. When a moving body strikes a heavy rigid body the force of the impact depends on the inertia of the moving body and on its speed. In the case of a spring suspended vehicle the obstacle is struck directly only by the non-suspended part, and it is chiefly the mass of this part which determines the force of the blow. The spring suspended part will not be deflected from its course as much or as abruptly as the non-suspended part and, while it contributes to the shock, it does so in a much lesser degree than if it were rigidly mounted on the axles.

Spring suspension of the front end of the conventional tractor with rear drive does not involve any structural difficulties. Moreover, spring suspension of the front end is more necessary than spring suspension of the rear end, because all or nearly all of the more delicate mechanism, such as oiler, magneto, governor, etc., is located nearer to the front than to the rear axle.

On creeper type tractors the forward end is practically always spring suspended. Owing to the low pressure per square foot of ground contact with the creeper type, the latter undoubtedly has more need for spring suspension. The suspension sometimes takes the form of a cross spring by which the engine supporting frame is carried on the truck. In other cases coiled springs are used.

There are three different methods of suspending the front of a wheel type tractor. In a few instances, half-elliptic side springs are used, as in passenger cars and trucks. However, it is generally considered that this construction does not offer sufficient flexibility for farm tractors. The centrally pivoted axle is so common in farm tractors that it may almost be considered standard. If the springs could be made as flexible as automobile springs, the side springs might do, but such is not the case. There being springs only at the forward end, this already reduces the magnitude of the ground warp to which the tractor will readily accommodate itself by about one-half.

The older type of spring suspension used on wheeled trac-

tors is that employing coiled springs. As far as the qualities of suspension are concerned, there is certainly very little difference between the coiled spring and the flat leaf spring. With the former there is no equivalent to the interleaf friction of the latter but at the low speeds at which tractors operate the rebound is not a factor of importance, so this does not matter. The objectionable feature of the coiled spring is that it has to be paralleled with a sliding pin or sliding pins through which the drive can be transmitted from one to the other of the parts separated by the spring.

To prevent undue wear of these pins and their guides they must be well lubricated, and inasmuch as these parts are directly exposed to the dust raised by the front wheels this is practically impossible. The closer the sliding joint is to the wheel the worse the conditions. If the sliding pin and guide could be surrounded by a leather boot filled with grease, it might be possible to get tolerably good wear out of such constructions, but leather boots are not in favor with tractor designers, and with some types of spring suspension they would be practically impossible.

Of course, wherever there is a spring suspension there must be sliding motion. But while in the case of guides parallel to coiled springs the motion is equal to the spring play, with leaf springs pivoted or shackled to the frame or axle, the motion on the surface of the shackle bolt will be only about one-twenty-fifth of the spring play. It is obvious that the smaller the range of motion the less will be the amount of wear on the pins or bolts. Moreover, a shackle pin or spring bolt is naturally much better protected against dust and dirt than a pin sliding in a guide with a range of motion of ½ in. or more. Therefore, it would seem preferable to use plate springs owing to the better wearing qualities of the connection.

As regards the range of spring action, this can be made comparatively small, owing to the low speed. The stiffer the spring the higher its natural rate of vibration and the better it is adapted to absorb shocks following one another at short intervals. Of course, it is not to be understood that the stiffest spring is the best, as this would logically lead to the conclusion that no spring at all would be best of all. The point is that as compared with motor trucks, and especially passenger cars, the vibrations of the running gear, which the springs must prevent from being transmitted to the frame, are essentially of short period. A compression of 1 in. under the dead load upon it and clearance for a slightly greater additional deflection under shock would meet the requirements. The obstacles causing these vibrations, in the case of a motor truck or passenger car, are absorbed by the rubber tires.

At the Kansas City tractor show there were nearly a dozen makes of tractors with spring suspension in front. A large variety of designs were represented, including half-elliptic side springs, half-elliptic cross springs, inverted half-elliptic cross springs, coiled springs on the steering knuckle and coiled springs at the center of the axle. Sketches of some of these suspensions are shown herewith.

Rear spring suspension in tractors is very rare. The chief reason for this is that the transmission of power from a spring-suspended frame to the rear wheels or rear axle involves difficulties. In the few cases where the rear end is spring-suspended it is supported on the axle through the intermediary of coiled springs, the axle moving up and down in a guide slot in the frame itself or in a bracket secured to it. It is figured that the slight range of spring play, although it does change the center distance between bull gear and pinion, does not change it enough to appreciably affect the mesh of the teeth. The driving thrust is transmitted to the frame directly and the torque reaction comes on the bearings of the bull pinion shafts.

Water Injection in Oil Engines

VARIOUS effects of the injection of water into the cylinders of internal-combustion engines are discussed by A. F. Van Amstel in the columns of *Engineering*. He says the misleading statement has been published that the use of water injection for obtaining increased power has been proved to be attended with injurious results to the engine because the sulphur present in the oil combines with the water and forms sulphuric acid, which rapidly eats away cylinder walls, pistons and piston rings.

The fact is, however, that the worst fuel does not contain more than a maximum of 2 per cent of sulphur and at the same time contains at least 6 per cent of hydrogen. This hydrogen combines with oxygen of the air and forms water, a part of which latter combines with the sulphur and more oxygen, forming sulphuric acid, according to the equation:

$$2S + 3O_2 + 2H_2O = 2H_2SO_4.$$

So 4 parts of hydrogen form sulphuric acid by combining with 64 parts of sulphur and 128 parts of oxygen, the atomic weights of the said elements being (rounded off) 1.32 and 16 respectively. Whereas the fuel does not contain more sulphur than one-third of the weight of hydrogen contained in it, it is clear that it is impossible that injection of water can cause the formation of more sulphuric acid than is formed if no water at all is injected. In using oil containing sulphur it is advisable to avoid the use of copper or copper alloys, not only in the engine proper but also in the fuel pump and all parts coming in contact with the fuel or the burnt gases.

The injection of water into internal-combustion engines is very useful, if it is arranged in a judicious way, because it greatly improves the combustion process by its catalytic action and in proportion as combustion pressure is produced earlier during the working stroke, the mean pressure, of course, is higher, so more power is obtained from the same quantity of fuel. The water vapor prevents the combustion from proceeding slowly and tardily, and obviates the possibility of formation of soot and other products of incomplete combustion. This catalytic acceleration of combustion processes by water vapor is very remarkable.

Dixon observed that a completely dry mixture of carbon monoxide and oxygen cannot be ignited, neither by a red-hot spiral nor by induction sparks. After adding water vapor, however, the mixture becomes explodable. A carbon monoxide flame goes out in dry air. Dry nitro-cellulose detonates with a velocity of 3750 m. per sec., whereas wet nitro-cellulose burns with a speed of 6000 m. per sec.

The Motorcycle Outlook in Great Britain

THAT there will soon be a great shortage in motorcycles in Great Britain is the opinion of Duncan Watson, managing director of the Harley-Davidson Motor Co., Ltd., of London, at present in this country. Says Mr. Watson:

"Of course, there is an absolute embargo on the importation of American motorcycles, automobiles and motor trucks into the British Isles at the present time. It seems to be the consensus of opinion, however, that within a few weeks this embargo will be partially lifted so that the British importers can bring in a limited number of American motor products. I believe that gradually the embargo will be further lifted by a process of rationing. It is not to discourage American competition that the present embargo is in effect. I want to emphasize this point because the impression seems to have gained ground that the embargo exists solely for the protection of the British manufacturers.

"As a matter of fact, most of us feel that the embargo is being used to hold up the rates of exchange more than for any other purpose. That is to say, that if the embargo was lifted completely there would be a tremendous in-rush of American-made products, which would create an overwhelming trade balance which would be detrimental to the rate of exchange, as you can readily see.

"The British post-war demand for motorcycles will not be satisfied until one million and a half motorcycles are put into the British Empire, one million of which will probably be absorbed in the British Isles alone."

Italy's War Vehicles Traveled to France by Own Motor Power

Cars and Trucks Took Road Over Alps Through Mont Cenis Pass—Airplanes Made Flight at Height of About 12,000 Feet

By W. F. Bradley

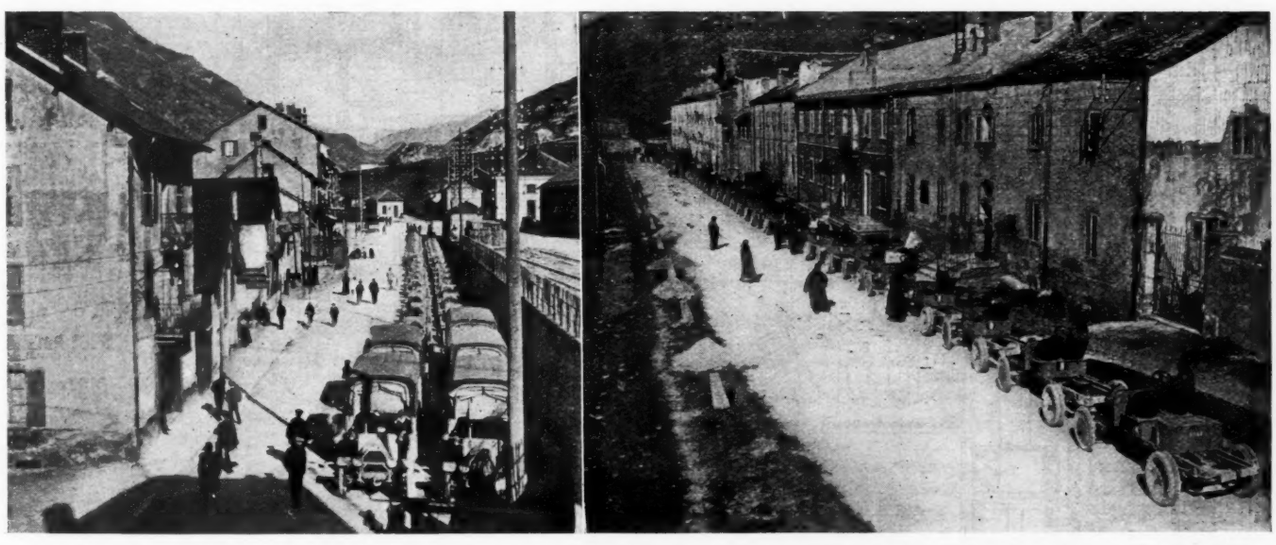
PARIS, March 19—The finest example that could be obtained of the value of roads to military operations is furnished by the passes over the Alps between France and Italy. There are three railroad lines connecting France with Italy, and the most important French line goes over the Alps by the Mont Cenis pass.

Very early in the war Italy became an important factor in furnishing motor vehicles to the allied armies, and the only practicable railroad route by which these could be delivered was via the Mont Cenis pass. It was not long before the insufficiency of this route was manifest and arrangements were made to make deliveries of automobile material by road whenever possible. There is a very fine road over the Mont Cenis pass. Italian automobiles for the French army, being practically all built at Turin, were delivered by road over Mont Cenis pass. Fiat was the first to start this service. From Turin to the French frontier station, on the eastern slope of the Alps, the distance is not more than 80 miles, but practically twenty of these constitute steady climbing, and the altitude attained is 7500 ft. Nearly every day a convoy of trucks or touring cars, which had previously been accepted by the French military commission, left Turin in charge of civilian drivers, climbed over the Alpine pass and were delivered at one of the French forts at Modane, about 6 miles inside French territory. From this point the civilian drivers returned to Italy by train and the following day came out with another and similar convoy.

All the roads over the Alps are snowed over from December to March or April. The authorities soon realized that they could not afford to lose these roads throughout the winter; consequently arrangements were made for gangs of soldiers to work on Mont Cenis pass in order to keep this road open for about two months of the closed period. At the beginning of the winter of 1918 all arrangements had been made for French territorial troops and 3,000 German or Austrian prisoners to keep this road free of snow throughout the whole of the year, so that had the war continued there would, for the first time in the history of the world, have been a stream of traffic across Mont Cenis throughout the winter.

After the disaster to the Italian army at Caporetto in November, 1917, the stream of traffic across the Alps changed in direction, for it became necessary for the British and the French to send temporary reinforcement into Italy. The two railroad lines were worked to the limit of their capacity; trains ran through from France to Italy at intervals of about 20 minutes, unloaded, and returned immediately, the authorities refusing to allow them to wait for a return load, so great was the need of sending men and supplies into Italy.

Italy supplied not a few airplanes to the French and American armies in France. At first these were shipped by rail, but it was soon realized that this method was slow and unsatisfactory. After a few experimental flights had been made over the Alps it was decided to send all planes from Italy to France on their own power. Most of these planes were built at Turin and Milan. Starting from this point they had to rise to a height of about 12,000 ft. in order to clear the top of the Alps safely. The necessary height was obtained while the planes were over the valleys, and the crossing was never attempted unless the safe height had been reached. As a precaution, the Italian authorities constructed a big landing ground on the top of Mont Cenis, 7000 ft. above sea level. A huge white cross was marked out in the ground and served as a guide to the pilots. In case of any accident which made it impossible for the pilot to continue his flight over the Alps into France he could always plane down to this Alpine landing ground.



Left—Fiat trucks for the French Army on the top of Mont Cenis pass, 7500 ft. above sea level. Right—Fiat trucks at Modane frontier station on the French side of the Alps. During the war all these vehicles were delivered over the Alps by road

Liberty Line of Wisconsin Engines

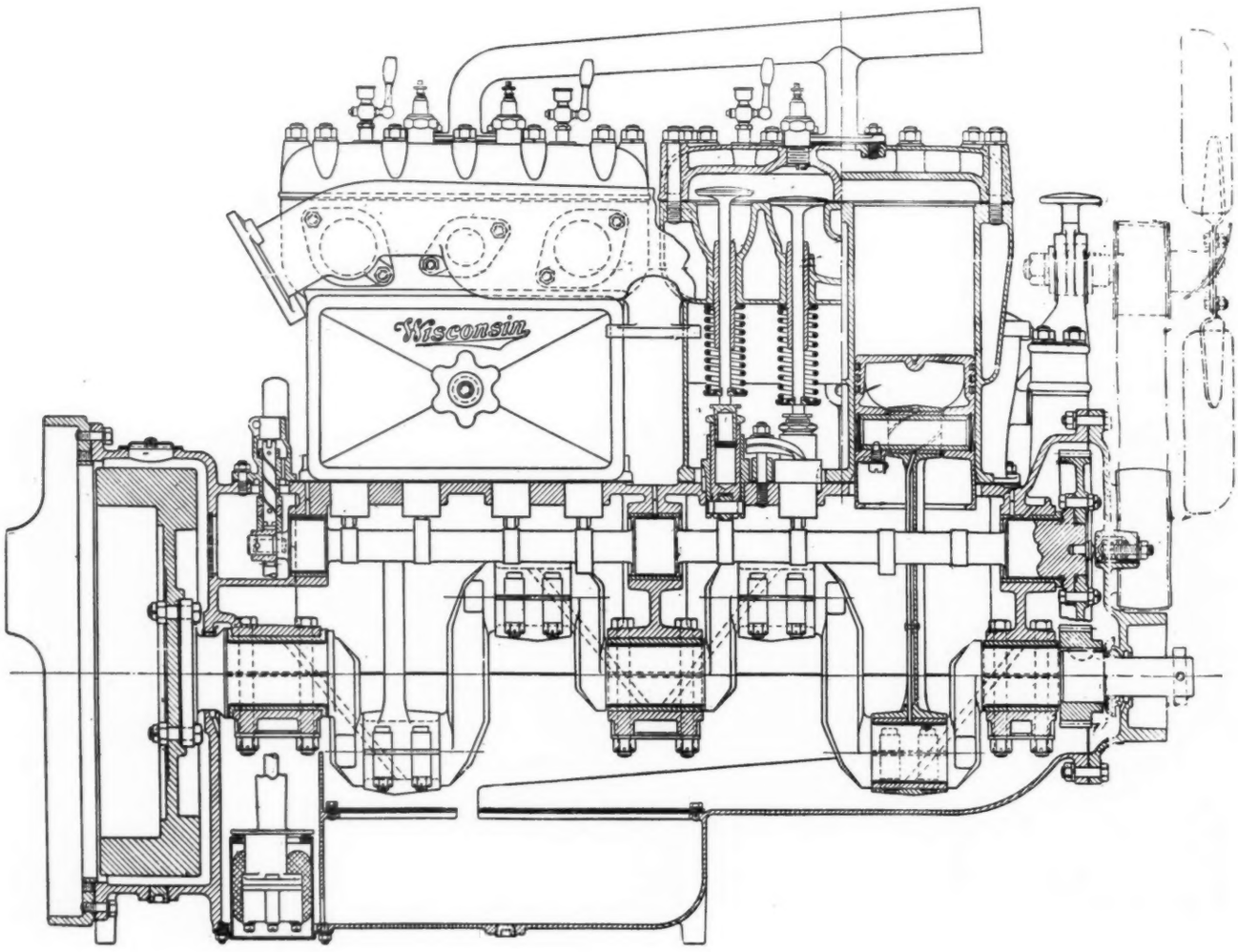
Principal Features Include Unit Power Plant Design, Aluminum Crankcases, Pressure Lubrication and "All-Steel" Three Point Support

A NEW line of four-cylinder engines, to be marketed under the trade name "Liberty," has been developed by the Wisconsin Motor Mfg. Co., Milwaukee. The line includes seven different types, viz., Type RAU, 4¾ x 6 in.; RBU, 5 x 6 in.; TAU, 4 x 6 in.; UAU, 4¼ x 6 in.; VAU, 4½ x 6 in.; EAU, 3¾ x 5 in.; BAU, 4 x 5 in. Of these different models the first two have their cylinders cast in pairs, with detachable cylinder heads, while the last five have their cylinders cast in blocks with solid heads.

Taking up the two larger models first, they have L-head cylinders, which are bolted to the aluminum crankcase. These engines are specially designed to handle the lower grades of fuel which are now offered on the market. The crankshafts are made of chrome nickel steel, 2¼ in. in diameter on the crankpin, and 2¼, 2 5/16 and 2⅜ in. diameter on the front, center and rear main bearings respectively.

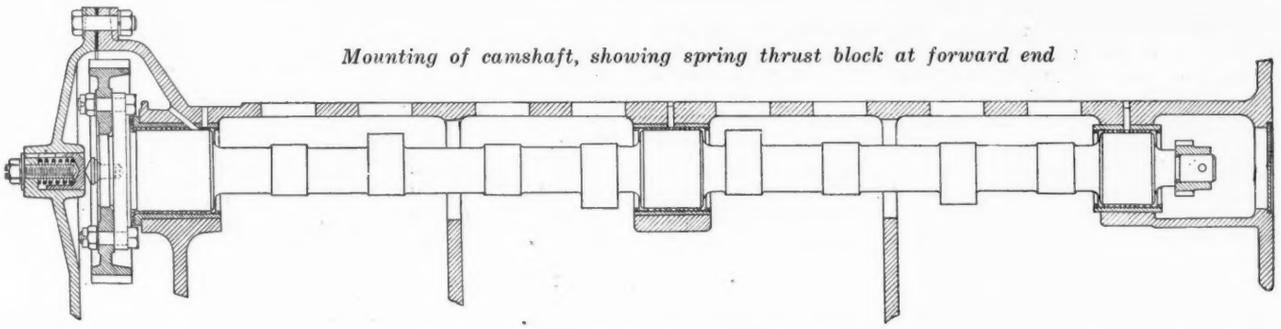
The crankcase is made of aluminum, with massive webs supporting the bearings. At the forward end there is a large, combined breather and oil filler, and an indicating oil gage is located on the same side of the case at the rear. As indicated by the "U" in the type designation of the engine, these two models are of the unit power plant type, and the flywheel is enclosed in a bell housing which is cast integral with the crankcase. The three point system of suspension is used, and special emphasis is laid on the fact that the engine has an "all steel" suspension. At the front it is supported on a trunnion bearing formed on the timing gear housing cover, while at the rear there is a cast steel or malleable supporting beam which is bolted to the bell housing. It is pointed out that dependence upon aluminum for support is undesirable, not only on account of the wear in the holes for anchor bolts, but also on account of breakage of the aluminum arms due to vibration. In case one of the steel arms should be broken in an accident, it can be very cheaply replaced.

The camshaft is formed with very large diameter bearings, and can be withdrawn from the forward end of the engine. To a flange forged integral with the camshaft at the forward end is secured the camshaft driving gear. A spring pressed



Longitudinal section of Wisconsin Liberty type engine

Mounting of camshaft, showing spring thrust block at forward end



plunger of hardened steel presses against a button head screw in the forward end of the camshaft, and presses it against the thrust flange of the forward bearing.

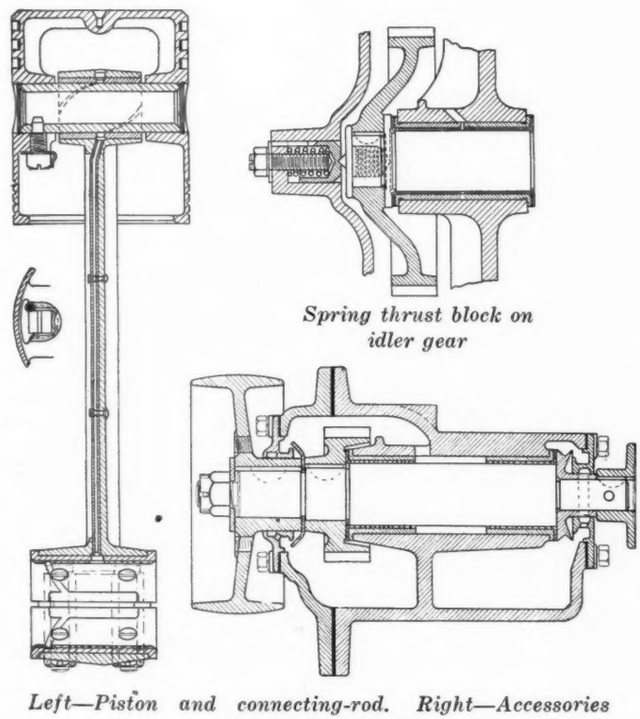
Valve tappets are of the roller type, of extra large diameter. The tappets, rollers and roller pins are hardened, to insure long life to these vital parts. The guides are of cast iron and are held in position by crabs and studs. This entire mechanism is inclosed by an oil type cover plate, which keeps out the dust. Openings are provided into the crankcase so that the oil vapors from the latter rise to lubricate the tappets and valve stems. The timing gears are cut with helical teeth, of wide face. The pinions of the timing gear are made of drop forgings, heat treated, while the large gear on the camshaft is made of cast iron. All main and connecting-rod bearings, as well as the camshaft, pump, drive shaft and other gear bearings, are of babbitt-lined bronze. Main and connecting-rod bearings are fitted with one-piece laminated shims.

The oiling system is of the pressure type, an oil header being cast in the crankcase, which leads to the main bearings. The crankshafts are drilled, so that the oil is also forced to the connecting-rod bearings, and through tubes on the rods to the piston pins. The oil pump is bolted to the upper half of the crankcase and extends down into the oil reservoir. A large screen surrounds the oil pump and can be removed for cleaning without disturbing the pump or the oil pan. A relief valve is provided on the pump, so that a constant pressure is maintained.

Combined inlet and exhaust manifolds are used, and are made of cast iron. They are so designed that the heat of the exhaust will vaporize the low grade of fuel which must now be used. To insure economical use of fuel, the inlet passage is kept down in diameter.

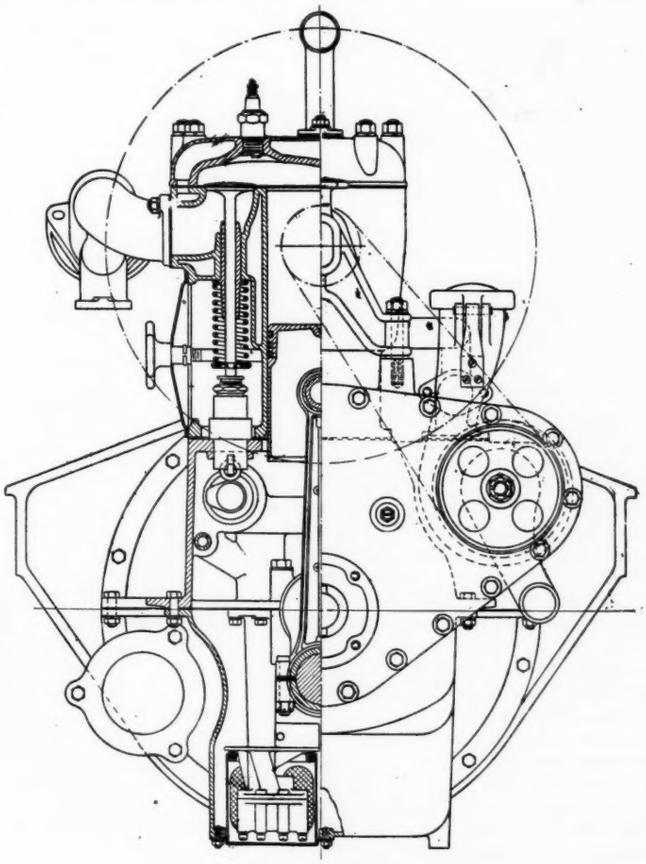
A substantial fan drive is provided, a 2-in. belt being used, which transmits plenty of power for the larger fans necessary for truck and tractor service. Provision is made for mounting electric generators and starting motors, the crankcase being designed with S. A. E. standard flanges. The locations of these accessories, as well as those of the carbureter and magneto, are so chosen as to leave all mechanism very accessible. An inspection of the drawings herewith will illustrate this, and will also bring out the fact that mounting of the steering gear on either the right or left side of the engine was provided for in the location of the various accessories. A drive is also provided for the various commercial governors, and manifolds can be furnished to accommodate same.

The second set of sizes, which are 4 x 6 in., 4¼ x 6 in., and 4¼ x 6 in. cylinders, follow very closely the RAU and RBU models just described except that they have block-cast cylinders and that the valve tappets are of the mushroom instead of the roller follower type. All of the dimensions are,



Spring thrust block on idler gear

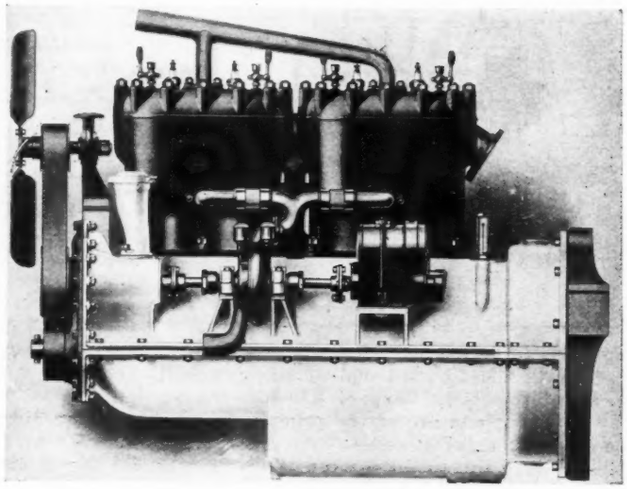
Left—Piston and connecting-rod. Right—Accessories driveshaft mounting



Cross section through cylinder

of course, reduced in proportion, the crankshaft, for instance, being 2 in. in diameter. It, however, is also made of chrome nickel steel, and the same material as in the larger models is used throughout.

In a general way the two smaller models, of 3¾ x 5 in. and 4 x 5 in. cylinder dimensions, also follow the above specifications. The principal exceptions are that the cylinders are cast in blocks, with integral heads, and that mushroom tappets are used. No relief valve is fitted to the oil pump on these smaller models, as the pump is smaller and does not require a pressure relief.



Wisconsin engine

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AS an evidence of the necessity which exists for immediate action, the latest published returns show, say the British Industrial "Safety First" Association, that, in 1914, 969 persons were killed and 147,045 were injured by accidents in workshops and factories alone, a large proportion of which would undoubtedly have been prevented had those who became casualties been educated in matters pertaining to their own safety. Millions of dollars paid in compensation, and huge sums of money lost to workers as wages, might have been saved and utilized to better advantage.

Oil-Shale Deposits in the United States

MUCH attention is now being paid to the oil-shale deposits in the United States, and the possibility of exploiting them to take the place of the liquid oil supply in due course, as it is estimated that the latter source of supply will be exhausted in about twenty years' time. Oil-shale deposits are found in several parts of the United States, but those in Colorado and Utah are the most extensive and have so far received the greatest attention. The following facts regarding the nature of oil-shale are taken from an article in *The Engineering and Mining Journal.*

Oil-shale has no oily appearance indicating that it contains free oil, but upon being subjected to heat its organic materials are broken up, and among other things, oil and gas are yielded. The yield varies from 6 to 90 gallons of crude oil per ton of shale. The crude oil distilled may give 7 per cent to 12 per cent gasoline, 28 per cent to 49 per cent kerosene and 39 per cent to 62 per cent residuum. Shale analysis indicates ½ per cent to 3 per cent moisture, 20 per cent to 52 per cent volatile matter and 45 per cent to 80 per cent ash. The asphalt varies from ½ per cent to 4 per cent and paraffin from 2 per cent to 9 per cent.

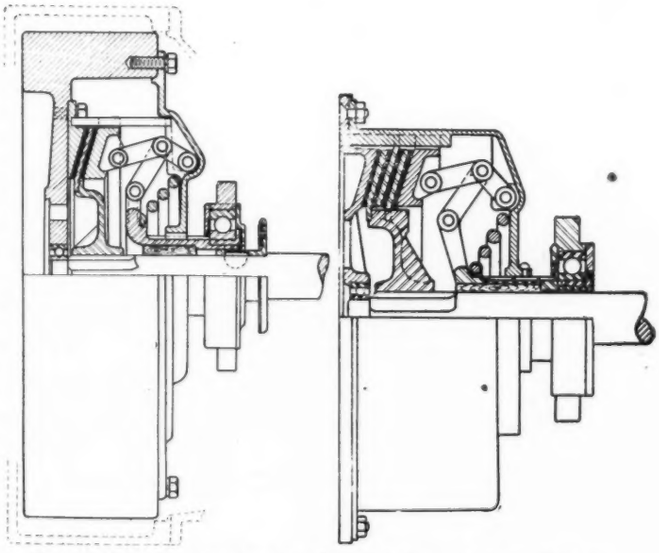
The by-products of oil-shale are extremely valuable and include gasoline, kerosene, lubricants, enamels, varnishes, paints, rubber substitutes, manufacturing products for glass, pottery and ornamental tiles, dyestuffs, ammonium sulphate, flotation oils and producer gas. The Colorado shale area covers more than 2500 square miles and the Utah area over 3000 square miles. The strata vary from a few inches to 80 feet thick. The yield is from 31½ to 80½ gallons per ton.

In Scotland over 3,000,000 tons of shale are profitably treated annually, but it is only the ammonium sulphate produced as a by-product which makes the business pay. On the other hand, the prospects of the American oil-shale industry should be good, as in Colorado and Utah the shale beds are relatively thick, suitably located high up for gravity transportation, and give a yield of 40 to 50 gallons per ton.

M. & E. Multiple Dry Disc Clutch

MERCHANT & EVANS CO. of Philadelphia, who for many years have been manufacturing the Hele Shaw multiple disc clutch, have recently brought out a new type of dry disc clutch. This is made in two forms, with a single driven disc and with multiple driven discs respectively. The clutch spring does not compress the discs directly, but acts on them through the intermediary of a toggle mechanism. It is claimed for the clutch that it contains very few working parts, is very simple and tool proof, and that it can be very easily disassembled. No adjusting means are provided, and owing to the peculiar construction of the disc compressing levers, a low-pressure spring can be used, thus making the clutch soft-acting. This clutch is recommended for both passenger car and truck use and, although first-class materials and workmanship are embodied in its manufacture, the makers state that it can be sold at a price within the reach of all motor vehicle manufacturers.

The same toggle mechanism that is used with the multiple disc clutch is also used with the single disc clutch. This latter type is made in two designs, one self-contained, the other of what is described as the flywheel type. This single plate clutch is intended for use in connection with engines up to 30 hp. The self-contained type of clutch is adapted for use where the engine and transmission are mounted separately, while the single-plate type is best adapted to unit power plant construction. The shifting collar of all these clutches is fitted with an annular ball bearing.



Left—M. & E. single plate flywheel type clutch. Right—M. & E. multiple plate clutch, showing toggle mechanism and ball bearing shifting collar

The Velie Biltwell Tractor

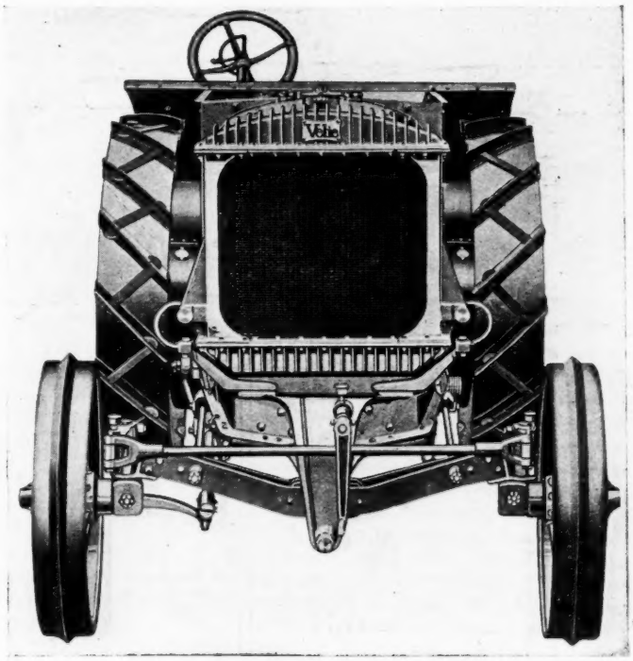
A 3-Plow Machine with Kerosene Burning Engine, 3-Speed Sliding Gear Transmission and Inclosed Bull Gear Drive—Flexible Running Gear with Spring Suspension of Frame in Front

By P. M. Heldt

FOR several years past the Velie Motors Corporation of Moline, Ill., has been doing development work on farm tractors, and had it not been for the war, the concern probably would have marketed its first product in this line nearly a year ago. However, in view of the difficulties in the labor and materials fields, and the restrictions placed on the tractor industry by the Government, the Velie corporation decided to suspend manufacturing operations until the end of the war, meanwhile continuing its field tests with a considerable number of machines.

The tractor was exhibited at Kansas City, and is now to be put in production. It must be classed as in line with the most modern trends in tractor design, smooth lines and complete inclosure of all working parts being its outstanding features.

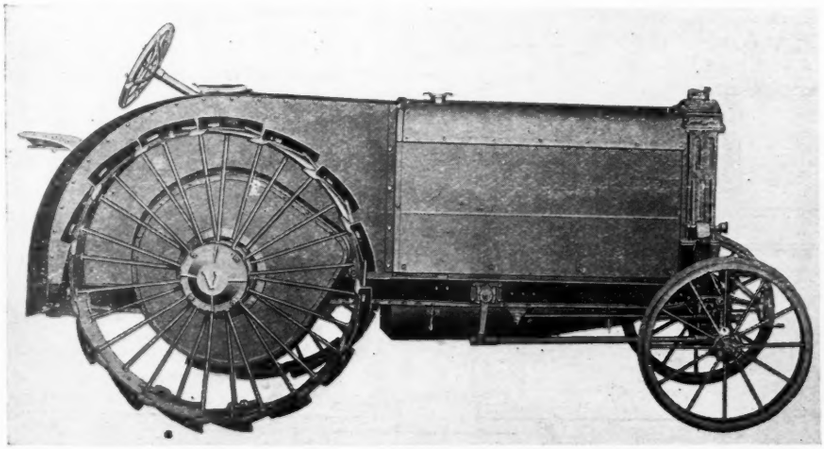
The engine is a four-cylinder type of 4⅛ in. bore by 5½ in. stroke, and the tractor has a 24 hp. rating. The four cylinders and the top half of the crankcase are made in a single casting, while the cylinder head is separate. The engine is specially designed for tractor work, and is of materially heavier construction than the Velie truck engine. It has a crankshaft of 2½ in. diameter, which is supported in three main bearings. The connecting-rod bearings measure 2¼ by 3 in. and the lengths of the main bearings (front to rear) are as follows: 3 7/16 in., 4½ in., 5 11/16 in. The cylinders are of the L-head type, and the valves are completely inclosed. In order to provide for access to the connecting-rod bearings, two large hand holes are provided in the upper half of the crankcase on the side opposite the valves. The valves have a clear diameter of 1 11/16 in. and a lift of ⅜ in. They are operated by means of cams with mushroom type cam followers. Bushed valve guides are used. The camshaft is supported in three bearings, which are quite liberal in size, as may be judged from the following dimensions: Front, 2½ by 2½ in.; center, 2⅜ by 2 3/16 in.; rear, 2 3/16 by 2½ in. Non-Gran bronze bushings are used for the camshaft bearings, while the crankshaft and connecting-rod bearings are of the bronze back, babbitt-lined type. The bronze used for these bearings is of the "Ring true" brand,



Front view, showing axle mounting, spring suspension of radiator, etc.

and a special tin babbitt is used. Non-Gran bronze is also the material for the piston pin bushings. The pistons are of conventional design, with three ¼-in. rings at the upper end, and three oil grooves at the lower end or skirt. The piston pins are hollow, hardened and ground, and are held in position by pin screws. H-section drop forged connecting-rods are used, and the caps are held in place by nickel steel heat-treated bolts. As may be seen from the sectional views of the engine herewith, all of the main bearings are completely supported from the upper half of the crankcase. The camshaft is driven from the crankshaft through a pair of helical gears, and there is an additional gear for the drive shaft. A 23-in. flywheel, weighing 163 lb., is bolted to an integral flange on the crankshaft. Including the carbureter and magneto, the engine weighs 885 lb.

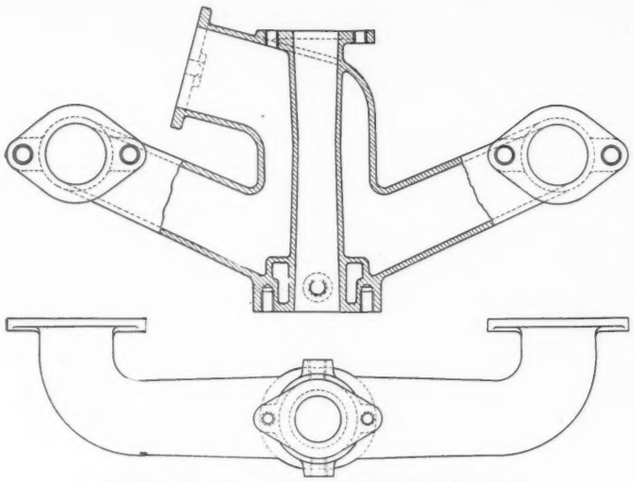
Kerosene is the fuel regularly used, and a supply of 22 gal. can be carried in the main fuel tank. There are also tanks for 2½ gal. of water and for 2½ gal. of gasoline. Water is drawn into the cylinders automatically whenever the engine runs under appreciable load. All tanks are of cylindrical form, and made of 16 gage terne plate, with welded seams. The gas-



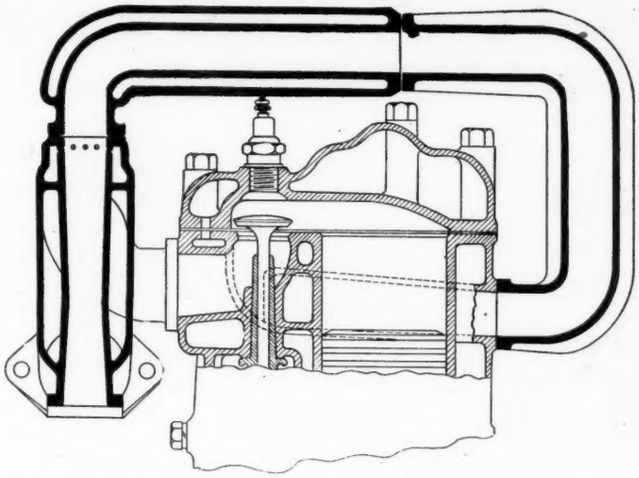
Side view of Velie tractor

Four-Cylinder Engine of the Velie Tractor

This engine has 4⅛ x 5½ cylinders, burns kerosene, is pressure-lubricated and is of heavy construction throughout



Combined exhaust manifold and inlet pipe



Inlet passage, partly water jacketed and partly air cooled

oline and water tanks are located under the hood, while the kerosene tank is located in back of the dash, crosswise.

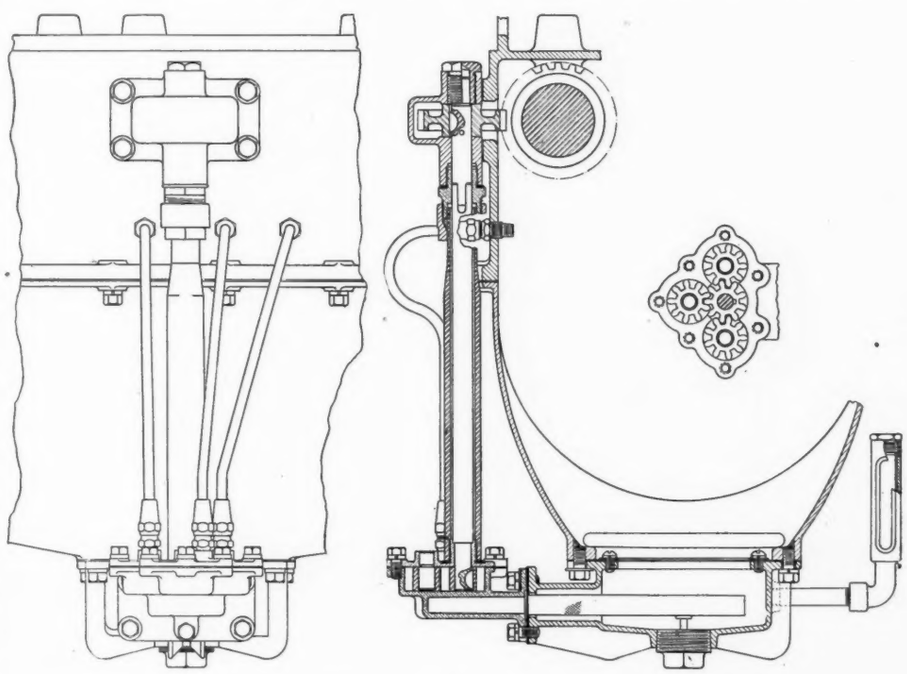
Two Kingston carbureters are fitted, one for starting on gasoline and one for operating on kerosene after the engine has warmed up. There is a three-way valve at the junction of the carbureters with the inlet pipe, so that either one of the carbureters can be shut off completely, or part of the mixture can be drawn from each. The water tank is located directly above the engine, and water passes through a T fitting, clearly seen in the photograph of the engine to the right of the inlet pipe, which fitting also contains a throttling or suction control valve. By means of this suction control valve, the feed of water can be regulated. The water feed is ordinarily so adjusted that from 2½ to 3 gal. of water are used to 20 gal. of fuel. Directly above the three-way valve in the inlet pipe is located the throttle valve for controlling the amount of charge entering the cylinders, and above this valve is an insert in the inlet pipe containing the throttle valve which is controlled by the mechanical governor. Then follows an offset section which brings the inlet pipe somewhat closer to the engine. The upper vertical portion of the inlet pipe is in the form of a venturi tube, and is completely surrounded by the exhaust pipe, except for a short length at the top, which is surrounded by a steam chamber. It is into this steam chamber that the water from the water control valve is fed. From the steam chamber there are a number of jets or outlets into the inlet pipe. An equalizing tube extends from that portion of the inlet pipe surrounded by the steam chamber to the offset portion of the inlet pipe referred to in the foregoing.

The combination inlet and exhaust manifold extends to a height even with the tops of the engine cylinders, and thence a water jacketed inlet pipe extends across the top of the engine to the opposite side. The inlet pipe then drops to the middle of the cylinder block, where it bolts over the end of the inlet passage which extends through the cylinder block between the second and third cylinders. While that portion of the inlet pipe located on top of the engine is water jacketed, that section extending down to the connection to the cylinder block is provided with cooling ribs. A Bennett air cleaner is fitted to the air inlet to the kerosene carbureter. There is a supplementary air valve at the connection of the inlet pipe to the cylinder block.

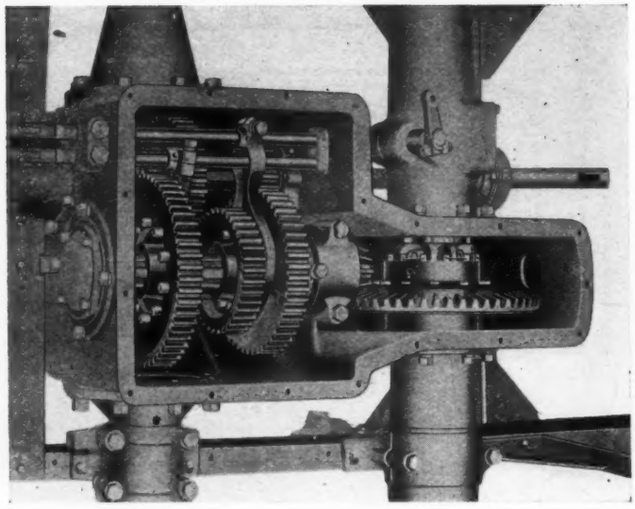
Ignition is by a Kingston high tension magneto, with impulse starter, which is mounted on a bracket cast integral with the bottom half of the crankcase, on the carbureter side.

Design of Cooling System

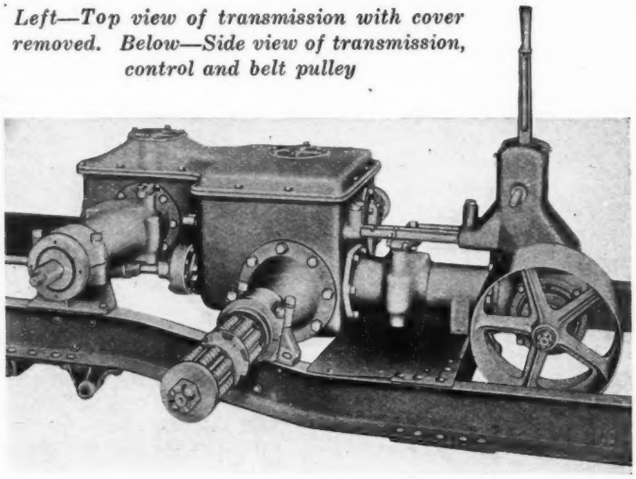
Special attention appears to have been given to the design of the cooling system. It will be noticed from the sectional views of the engine that the jackets extend all the way down the cylinders, and the cooling water is also carried all around the spark plug bosses and the valve seats. A tubular type of radiator, with Bremer core, is used. It has a cast shell and radiating fins are cast on both the top and bottom tanks. In order to protect the radiator against severe shocks, which are inevitable with a machine of this type, it is supported on two scroll springs. Back of the radiator is mounted a four bladed fan, containing a Hyatt roller bearing, and driven by a 2-in. belt. Means are provided for adjusting the tension of this belt. The total water capacity of the cooling system is 7½ gal. The water is circulated by means of a centrifugal pump having a patented flexible mounting. The pump is really mounted on the driving shaft, and has a one



Oil pump and connections



Left—Top view of transmission with cover removed. Below—Side view of transmission, control and belt pulley



point support on the gear case cover, so that it can automatically adjust itself to the position of the driving shaft. Water enters the cylinder jackets at the bottom and leaves at the top. The water jackets are cast with baffle plates which insure circulation to every part.

Force Feed Lubrication

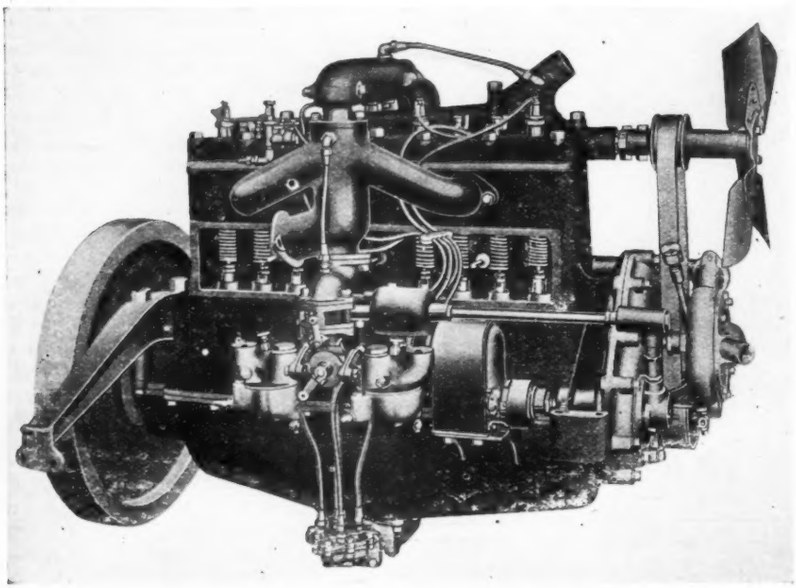
Lubrication is by the force feed system. An oil pump of the gear type is used, and is located at the lowest point of the engine, but outside the crankcase, where it is readily accessible. This pump is driven by a helical gear from the camshaft, through a vertical shaft with tongue and groove joint, just below the gears. The pump is located at the side of the oil sump and delivers oil through outside pipes under 40 lb. pressure to each of the main engine bearings. It is forced through drill holes in the crankshaft to the crank pin bearings, and through tubes leading up the connecting rods to the piston pin bearings. Thus, the lubrication of all the power carrying parts is effected by force feed and the pressure of feed at normal engine speeds is about 40 lb. to the square inch. There is a branch from each main bearing leading to the corresponding camshaft bearing, so that camshaft lubrication is also by force feed. It is recommended that when the tractor is in constant use, the oil should be renewed every forty hours.

A Borg & Beck 12 in. plate clutch is used, and is mounted on the flywheel, being enclosed in a separate revolving drum. The transmission is of the company's own design, and affords three forward speeds in addition to a reverse. It is similar in layout to a motor truck transmission. The two shafts are mounted one above the other, the lower being the primary shaft. All gears are made from forgings of 3½ per cent nickel steel, and are cut with 6-8 pitch teeth, the face widths being 1½ and 1⅝ in. Timken roller bearings are used throughout the transmission. On the ring gear end of the jackshaft a Timken bearing is used, and on the other end a Hyatt. There are two hand holes in the top of the transmission case. All moving parts of the transmission are run in oil. An extension of the primary shaft backwards, provided with a jaw clutch, carries at the rear end a bevel gear meshing with another bevel gear on the belt pulley shaft. This set of bevel gears gives a reduction of speed in the ratio of 22/17.

Belt Pulley at Rear

The belt pulley, which is located at the rear on the left-hand side, is 13 in. in diameter with 7 in. face. With the gearing specified, a belt speed of 3067 ft. per min. is obtained, at normal engine speed. The radial load on the pulley shaft is taken on a Hyatt bearing and the thrust load on a Timken. There is a safety bolt at each end of the belt pulley shaft. Control of the change gears is effected selectively by means of a lever working on an H-quadrant. The jackshaft of differential gear housing is built in one with transmission housing. The final drive is by bull gears of the spur type, which run in a bath of oil. The joint in the housing is only 3 in. from the axle, and 1½ gal. of oil is poured into each housing. This supply is said to be sufficient for a year.

The frame of the Velie tractor is built up of 5-in. steel channels weighing 9 lb. per ft. These frame members are bent so that they come below the rear axle. Everything on the frame is riveted and 7-in. gussets are used so as to insure the greatest possible rigidity. The rear axle is made of 2½-in. round stock, heat-treated and ground. Hyatt roller bearings are fitted in the rear wheels, there being two bearings at each end of the axle, each bearing 4 in. long. There is no single solid axle extending from wheel to wheel, but instead two short axles are used, each pressed into a cast axle horn which is bolted to the transmission. These horns are clamped between the axle brackets and their caps. The frame comes to a point at the front, and has a pivot support below the front axle, the center of the support being only 10½ in. from the ground.



The Velie tractor engine, carbureter side

The front axle is made of strip steel, and is riveted to cast steel axle ends. Drop forged steering knuckles are used, and are fitted with Timken roller bearings on the axle stub. The knuckles are of the Lemoine type, and steering is effected by means of a hand wheel and a worm and nut steering mechanism. The steering lock is such that the tractor can be turned around in an 18 ft. diameter circle, figured to the center of the machine. Two and one half turns of the steering hand wheel are required to bring the front wheels from hard over one way to hard over the other way. A reduction of 12:1 is obtained by means of the screw and nut mechanism. The steering hand wheel is provided with a wood rim and the steering mechanism is really a standard truck steering gear. Center control is used, and the spark and throttle levers are mounted on the steering wheel.

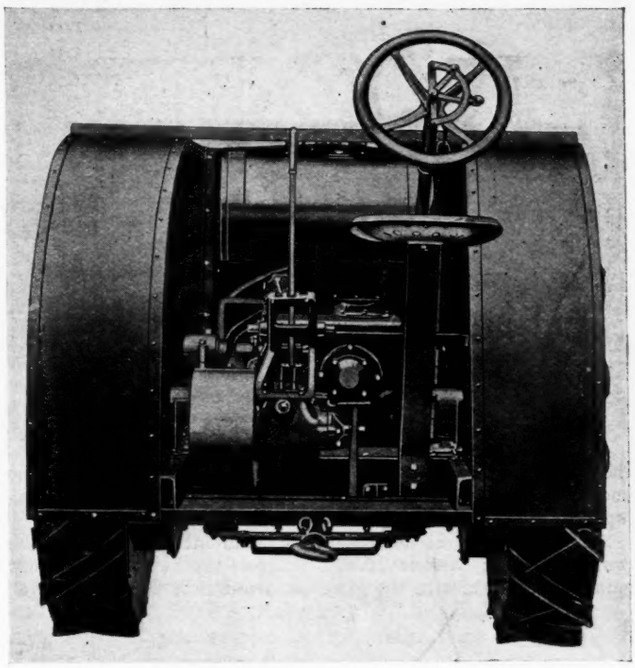
Built-Up Wheels

Both sets of wheels are of the built up type. The front wheels are 32 in. in diameter by 5½ in. width of tire, the tires being of the flanged type, and the spokes of round section. The rear wheels, which are 52 in. in diameter by 10 in. width of face, also have round spokes and flanged tires, the flanges being 1¼ in. wide. At the rear of the tractor there is a frame extension which carries a wood platform on which the driver can rest his feet.

The drawbar attaches to a cross member of the frame. A bracket is riveted to the center of this crossbar, and from it run brace rods to the side members of the frame at points where the bull pinion bearings are located.

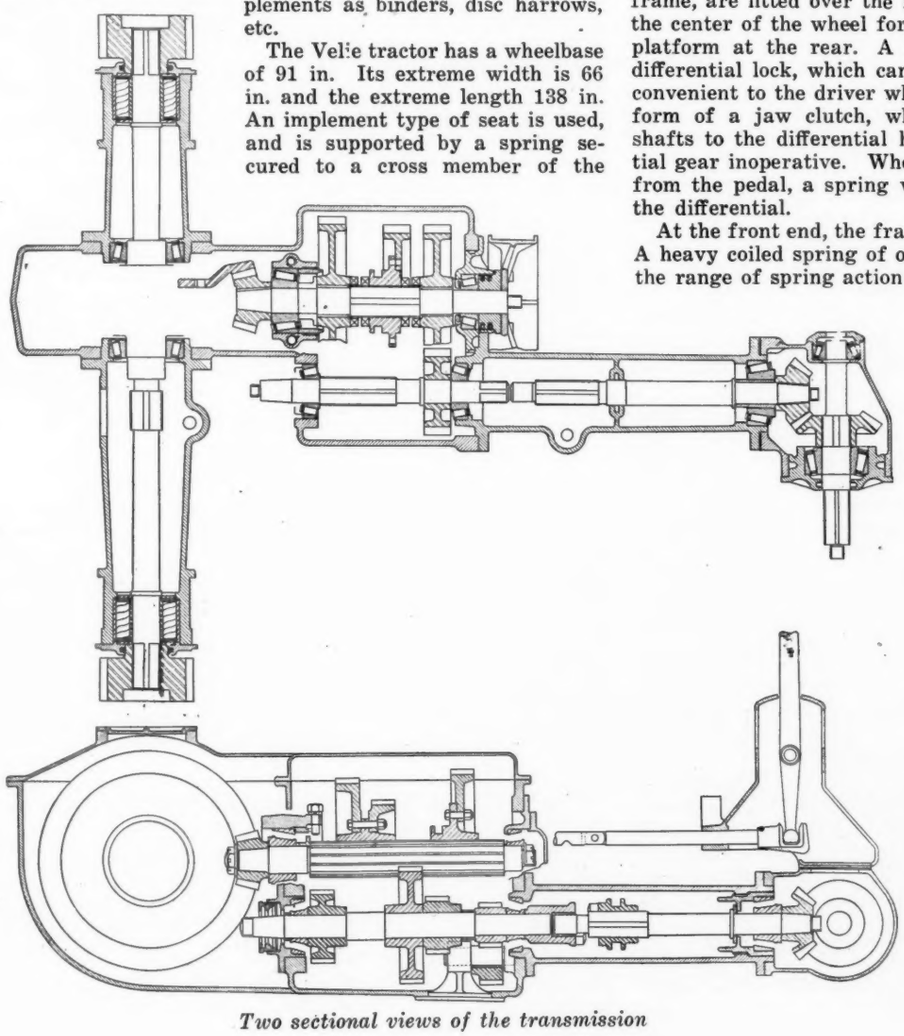
There is a spring cushion in the drawbar, and the latter has 18 in. lateral adjustment on a crossbar riveted to rear extensions of the frame. The hitch is 16½ to 17 in. from the ground, which is a convenient height for hitching such implements as binders, disc harrows, etc.

The Velie tractor has a wheelbase of 91 in. Its extreme width is 66 in. and the extreme length 138 in. An implement type of seat is used, and is supported by a spring secured to a cross member of the frame. Mud guards of No. 18 sheet metal, with an angle iron frame, are fitted over the rear wheels. These extend only to the center of the wheel forward, but down to the level of the platform at the rear. A feature of the Velie tractor is a differential lock, which can be engaged by means of a pedal convenient to the driver when in the seat. This lock is in the form of a jaw clutch, which locks one of the differential shafts to the differential housing, thus making the differential gear inoperative. When the operator withdraws his foot from the pedal, a spring withdraws the clutch, thus freeing the differential.

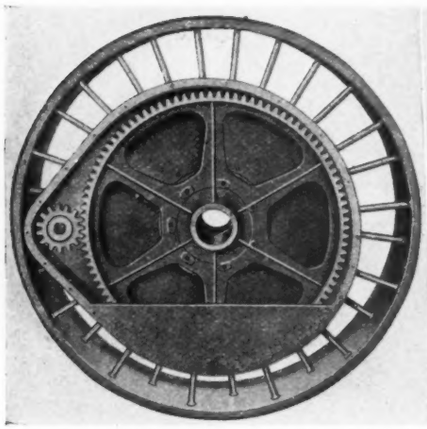


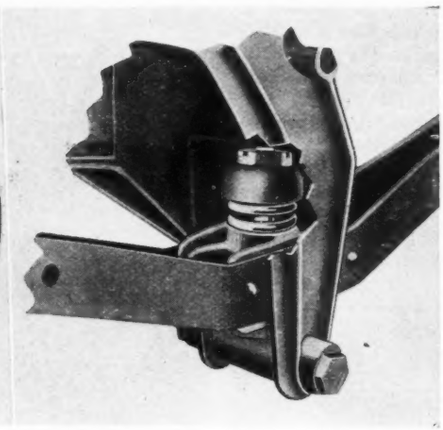
Rear view of tractor

At the front end, the frame is spring supported on the axle. A heavy coiled spring of only a few turns is used and, while the range of spring action is small, it suffices to relieve those short period shocks which are so harmful to tractor mechanism. The front axle is braced to the tractor frame by two radius rods, which extend substantially parallel with the frame side members. The rear end of these brace rods is pivoted to brackets riveted to the frame, while the forward end extends through holes in the front axle, and is surrounded by coiled springs on both sides of the axle which act to relieve severe shocks on the brace rods. A mud pan of No. 16 gage sheet metal is located under the engine, and is designed chiefly to protect the engine from trash. The engine is set 2 in. to one side of the frame center. There is a permanent sheet metal hood over the engine, but the sides of the engine space are covered with heavy duck. Snap fasteners are used to fasten the duck at the bottom to the tractor frame, and a 5/16 in. steel rod is secured to the duck about half way up so as to prevent it from blowing against the engine. These duck curtains roll up and fasten by straps to



Two sectional views of the transmission





Left—Rear wheel, with bull gear and pinion and case for same, showing provision for keeping oil in

Right — Spring support of forward end of frame and pivot mounting of front axle

the hood. The water and gasoline tanks are located under the hood, with their filler openings projected above it, thus making filling of these tanks an easy matter.

All of the control devices are conveniently located at the rear. The gear shift lever also controls the belt clutch, there being an extra slot in the gear quadrant into which the lever is moved when it is desired to do belt work. This makes it absolutely certain that all of the gears are out of mesh when the tractor is used for doing belt work. All control levers are of neat and handy form

The price of the Velie tractor, completely equipped, including a set of Loxon lugs, is $1865.

Hints on Storing Timber to Prevent Decay

MANY serious losses from decay in wooden structures are possibly due to the fact that the timbers used were infected with wood-destroying fungi while in storage. These losses can be greatly reduced by keeping lumber storage yards in a sanitary condition. Some hints as to how to do this, issued by the Forest Products Laboratory of the U. S. Forest Service, Madison, Wis., are given below:

Strong efforts should be made to store the product on well-drained ground, removed from the possible dangers of floods, high tides and standing water.

All rotting débris scattered about yards should be collected and burned, no matter whether it be decayed foundation and tramway timbers or stored lumber which has become infected. In the case of yards already filled in to considerable depths with sawdust and other woody débris the situation can be improved by a heavy surfacing with soil, slag, or similar material. Weeds should be cut away from the piles to allow good ventilation.

More attention should be given to the foundations of lumber piles in order to insure freedom from decay and better ventilation beneath the stacks. Solid foundations should never be used. In humid regions the stock should not be piled less than 18 to 24 in. from the ground. Wood blocking used in direct contact with wet ground should be protected by the application of creosote or other antiseptic oils, or else replaced by concrete, brick or other durable materials. Treated skid timbers would also be highly advantageous.

Foundations should be built so that the piles will slope approximately 1 inch to every foot of length.

In most regions lumber should not be close piled in the open, but should be "stuck" with crossers at least 1 in. thick. Lateral spacing is also very desirable. Roofing or cover boards on piles should not be neglected, and should extend over for several inches in front and back.

Instead of throwing the "stickers" about on the ground to become infected with decay, they should be handled carefully and when not in use piled on sound foundations and kept as dry as possible. If pine, saturated with resin, or the heartwood of such durable species as white oak or red gum, be employed, the danger of possible infection will be greatly decreased.

In storage sheds the necessity for piling higher from the ground is very apparent in many cases. The same remedies apply here as for pile foundations in the open. The sheds should be tightly roofed and the siding should not be run down below the bottom of the foundation sills. Free air circulation should be allowed from all sides beneath the inclosure. Only thoroughly dry stock should be stored in close piles under cover.

Should fungous outbreaks occur in storage sheds not constructed to meet sanitary needs, the infected foundation timbers should all be torn out and replaced with wood soaked in an antiseptic solution or by concrete or brick. In all cases the new foundations should be so constructed as to keep the lumber well off the ground, and the soil and timber immediately adjoining the infected area should be sprayed or painted with an antiseptic solution of a water-soluble salt, like sodium fluorid, mercuric chlorid, zinc chlorid or copper sulphate.

A more detailed discussion of methods of handling lumber to prevent decay is to be found in Department of Agriculture Bulletin No. 510, "Timber Storage Conditions in the Eastern and Southern States with Special Reference to Decay Problems," obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C.; price 20 cents.

Theory of Action of Lead Cell

CH. FERY read a paper on the theory of the lead cell some time ago before the Société Française de Physique. It is argued that the usual assumption that the material of the negative plate passes through the form $PbSO_4$ during the discharge is a fallacy. This view is supported by a consideration of the change of weight of the negative plate during discharge, and also by the darkening of rolor of the plate, which would not be expected with the formation of white lead sulphate. It is more likely that Pb_2SO_4 is formed. This theory is supported by certain chemical reactions and changes of weight that were noted in experimental plates.

Carburetion Temperature of Oil Mixtures—Correction

N the article on the "Carburetion Temperature of Oil Mixtures" in the issue of AUTOMOTIVE INDUSTRIES for Feb. 27, there occurred a couple of typographical errors which should be corrected. In the second formula on page 491, the numerator ought to read $.01 \times 6.5 \times 760$ instead of $+ 760$ as printed. In the third formula on the same page the denominator should read 14×50, not $14 + 50$. In the last column on page 491, $746 = 460 = 286$ deg. Fahr. should be $746 - 460$.

Lack of Care in Promotion Retards Conference-Plan Development

Matters of Interest to the Worker Must Be Told in His Language—Legal Verbiage Unnecessary and Adds to Difficulties—Campaign of Education Required

By Harry Tipper

THE adoption of conference systems, the representative shop committees, and of joint government of working conditions by management and labor together is attracting a great deal of public attention and is being announced by more individual plants every day. In some cases the systems have not appealed to the worker as thoroughly as they should and in some cases the manufacturers have been disappointed by the results where they have only been working for a few months.

It is evident from investigations which we have made of the matter that three cardinal points have been lost sight of in the preparation of some of these plans. Perhaps this is due to the lack of appreciation on the part of the manufacturers as to the worker's point of view. There is a very deep-seated suspicion on the part of the worker in respect of the motive which is behind all voluntary suggestions by the manufacturer. This suspicion arises out of past history, which has, in too many cases, provided a justification for it, and out of the lack of understanding and the consequent partial viewpoint which the worker has. The important thing is not the reason for the suspicion, however, but the fact of its existence and its strength.

Worker Must Be Educated to Appreciate Plan

In the promotion of all plans looking toward the establishment of the shop committee, or conference system, which will provide the worker with some share in the management of his own affairs, it is necessary to take this suspicion into account and clear it away before the plan can become operative in any real measure. All the arrangements which are made in advance of the submission of the plan to the workers should have in mind this necessity for the education of the worker to the reasons behind the plan and the opportunities presented by the plan.

In some of the details which have come to hand, concerning the action of individual manufacturers who have adopted this system, the carrying out of the plan and the provisions for its promotion among the workers indicate that the legal department of the company has controlled its preliminary operation too largely and the commercial, sales and advertising departments have not been consulted sufficiently in regard to the method of bringing it about. The attitude of the manufacturer who said: "It is true that we have made no attempt to promote this among the workers, feeling that a plan which offered such benefits and opportunities to the worker would, of course, be received with enthusiasm," does not offer any substantial hope that the conference system will work itself out in such a plan without considerable difficulty, before the workers' and employers' representatives come to any common ground of understanding. It is particularly unfortunate that a measure of this kind, which is intended to bring about a more democratic arrangement in the government of the worker's condition and give him a voice in the affairs, should be promoted in such a way that it does not bring with it a realization that its inception is due to a keener understanding of the demands of industrial progress and a more intimate knowledge of the worker's necessities and aspirations.

The terms of the conference plan, in a number of these cases, are characteristic of the methods of legal departments and the language of a lawyer. It is undoubtedly wise that the legal department of a large company should have a good deal to do with the articles constituting the conference plan, but the lawyer is not a close student of human affairs in business as a rule. His method of approach to a question does not lead to that simplicity and clarity which is absolutely necessary in a case of this kind if the value of the method is not to be befogged by the verbiage that surrounds its constitution.

In the manufacturing business the men who have charge of the sales and advertising work are better equipped to arrange an idea so that it will convey the right impression to the people who are to receive it. Their business every day necessitates the use of this knowledge and the cultivation of a considerable amount of it.

Where a conference plan is to be adopted, or where any organization changes are to be made in the expectation that they will offer a basis for the solution of the labor difficulties, the adoption of such a plan is of sufficient importance to justify the employment of the best brains in the concern for each particular part of the work, and no part of the preparatory work can be slighted without increasing the difficulties of operating the plan and materially lengthening the time required to make it successful.

Plan Must Be Adapted to Particular Case

In the case of one plan with which we have been in touch, the general counsel and the executives of the company spent not less than nine months investigating the merits of this or that plan and making their decisions upon the modifications necessary for that particular manufacturer. These provisions were drawn up, then the plan was presented to the workers by means of a notice and a dry booklet merely containing the proposed provisions. The whole presentation of the plan to the workers occupied three weeks and hinged upon the character of the notice and the booklet. Yet it is evident from the character of the booklet and the notice that no man who was accustomed to the work of impressing a body of men with the importance and value of a new idea had anything to do with the handling of these two matters. In fact, the adopting of this system by the workers in this particular organization, in the face of the methods which were employed to promote it, simply indicates the value

of a plan which can succeed in spite of such a presentation.

The mixture of races which obtains in many plants has not been taken into consideration sufficiently in most of the cases where this plan has been presented to the worker. It is sufficiently difficult for the average worker to understand, without an educational process, the benefits which he is to secure from a plan of this kind where he is conversant with the English language, the political habits and the ideals of the American people. It is sufficiently difficult to remove the suspicion which attaches to his mind where this background is provided.

In most plants, however, the problem is complicated by the fact that the labor is largely foreign, frequently including as many as twenty different races, few of whom have any knowledge of democratic institutions, most of whom have been brought up in the tradition of feudal systems, whose knowledge of English is frequently very limited and who have no background of traditional understanding of the American habits of mind and general political arrangement. Yet it is expected that these mixed races will, in the course of two or three weeks, with a single notice, a few brief explanations and a complicated document of provisions, understand what they are to vote about and the benefits which they are about to receive by virtue of such voting. Under these circumstances it is not amazing that in some cases the voters have not approved of the plan. The only amazing thing is that the workers have in most cases approved of the plans and that the rejections have been so few and far between.

Whether the plan has been adopted or not, under these conditions the lack of care and attention in the promotion of the plan, particularly to the mixed races that are to be found in most of the large manufacturing establishments, will, without any question, militate against the progress of the plan, increasing the difficulty of getting it into thorough working order, and lengthen the time which is necessary before it will be of definite value.

The third item which has not been sufficiently considered in the presentation of this plan is the necessity for simplicity in the provisions of the plan and the danger of including in the constitution too many operating definitions and limitations.

Temporary Character of All Operating Plans

It is necessary to emphasize again, as we have emphasized before, the temporary character of all operating plans in the building of human organization. The operating necessities are constantly changing and the value of any committee, or any established body, within an industrial organization grows as the body gets to work and makes it valuable for decision upon or discussion of matters which were not originally thought of. This is true of all legislative organizations and all committees which deal with policy and the methods of putting that policy into operation. Under these circumstances the provisions of the plan as it is presented for adoption should be as simple and elastic as possible. The committee, or conference, should be started at work upon the least important and most immediate of operating necessities, but neither its authority nor its work should be so limited by the original provisions that it cannot be extended in its operations to cover matters for which it proves to be the most effective body as it grows and develops.

There is a second danger involved in complicated provisions, and that is the danger of a constant discussion as to the interpretation of those operating provisions which lead away from the main issues and prevent the organization from proceeding in an orderly way toward the development of the proper harmony in the main requirements.

We have received in the course of the last few months booklets containing the plans established by approximately twenty-five organizations, and in 70 per cent of these cases, where these booklets have been passed out for comment in our own organization, they have elicited requests for further information in order to elucidate several of the provisions and statements of procedure. In four or five of these booklets the things for which the employee can be discharged without redress, the things to which the company reserves its rights and similar matters make up the first few pages of the booklet, while the plan which is intended to confer the various benefits upon the employees is left for the last pages of the booklet and presented without any real explanation.

The method of promoting and presenting the conference plans to the employees of the industrial organization is just as important as the character of the plan itself, and it will advantage the manufacturer greatly to see that those executives in his establishment who are most capable of understanding methods of promotion be called in upon the promoting and presentation, so that the plan is thoroughly understood before its adoption and the proper amount of enthusiasm created in respect to it. The value of the plan will be enhanced very greatly by such measures and the difficulties correspondingly reduced.

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The Strength of Commercial Liquid Glues

MOST of the commercial liquid glues are manufactured from the skins, heads and swimming bladders of fish. Others are made by special treatment of the glue extracted from the hides, skins and bones of cattle; some for special uses are prepared from starch, from various natural gums or from casein.

At the Forest Products Laboratory tests were made by B. A. P. inspectors on a number of these liquid glues, who found that they differ very widely in strength. Some of them are so weak as to be entirely unsuitable for woodworking purposes, while others compare favorably in strength with the "hot" glues. The glues tested varied from one which exerted a binding force of less than 50 lb. per sq. in. to one with an adhesive strength 60 times as great, or more than 3000 lb. per sq. in.

Liquid glues may be tested by gluing together pairs of specially selected hard maple blocks, placing them in a testing machine and measuring the force required to shear them apart. About 300 specimens, representing 26 different glues, have been tested in this way at the laboratory. According to the data thus obtained, a high-grade liquid glue should have an average shearing strength of not less than 1700 or 1800 lb. per sq. in.

In addition to uniform high adhesive strength, it is evident that certain other characteristics are desirable in a liquid glue. When spread upon wood surfaces, it should "set" and dry rapidly. In its container, it should remain fluid and workable at all ordinary temperatures. It should be elastic and shock-resistant. It should not be unusually susceptible to the action of high temperatures, high humidity, molds and bacteria.

The study gave evidence that the strength of liquid glue, like that of "hot" glue, depends largely upon its "body" or thickness, or, strictly speaking, upon its viscosity. Of 11 liquid glues examined, the thickest or most viscous glues showed the greatest adhesive strength.

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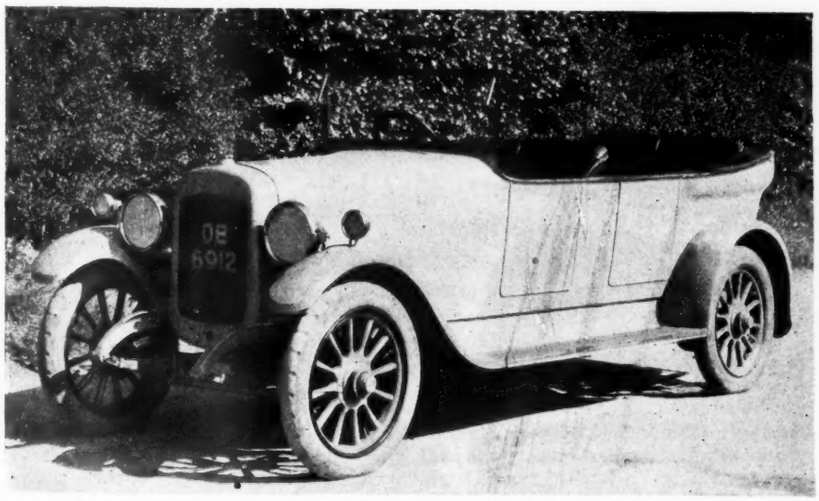
NO less than ten national aircraft factories were erected or purchased by the British Ministry of Munitions. All of these were completely finished, and engaged in production for some months prior to the armistice. The approximate cost of these establishments was $11,300,000.

A New British Quantity-Production Car



The Austin, Rated at 20 Hp., but Developing 45 Hp. on the Brake — Body Designed with Receptacle for Top—To Be Offered in Open Touring, Coupe and Landaulet Models

Austin open touring car

EUROPEAN manufacturers of automobiles have taken a leaf out of the book of their American confrères and are adopting a number of practices that, while popular here in the past, have been practically unknown abroad. One of these is the production of a single model in the greatest possible numbers consistent with manufacturing facilities and the visible market. Another is the production of complete cars instead of bare chassis. Both these practices are intended to reduce the cost of the machine to the consumer, and the ultimate object is to create a wider market.

One of the first British post-war models to be announced, and which is to be manufactured along these lines, is the Austin "twenty." This had been completed before the signing of the armistice and was shown to members of the delegation of American business paper repre entat ves which visited England and France in November and December of last year. In this connection it may be well to recall that the Austin plant grew enormously during the war and during its later stages employed around 25,000 persons. Consequently, if the resources of this enormous plant are to be devoted to turning out one passenger car model the annual output should be very high. It is somewhat surprising that the price contemplated is in the neighborhood of $2,000 for the standard touring model, which is considerably beyond that asked for American cars with much larger engines.

There are four L-head cylinders cast in block, with detachable head, and the crankshaft is supported in five bearings. The camshaft is driven by a silent chain of ample dimensions. The crankcase has large inspection doors.

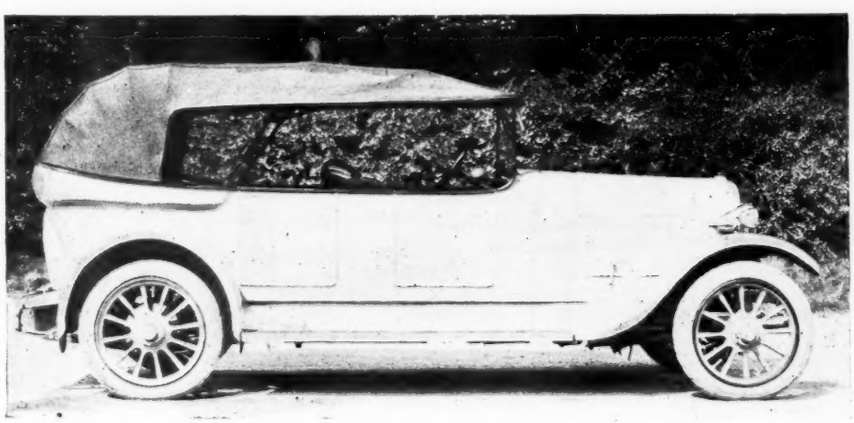
An automatic carbureter is fitted. The inlet pipe is combined with the exhaust manifold, so that ample heating may be obtained. An extra air valve is fitted and is controlled by a lever on the steering wheel. Ignition is by coil and battery with a high-tension distributer. Lubrication is by means of a gear pump which forces oil through the hollow crankshaft to all bearings. A strainer is placed in the bottom of the crankcase and by this means all oil is strained before being circulated. A strainer is also fitted to the filler. Cooling is effected by the thermo-syphon system. A honeycomb radiator of ample size is provided and assisted by a high-speed fan.

Some idea of the general characteristics of the car can be gleaned from the following specifications:

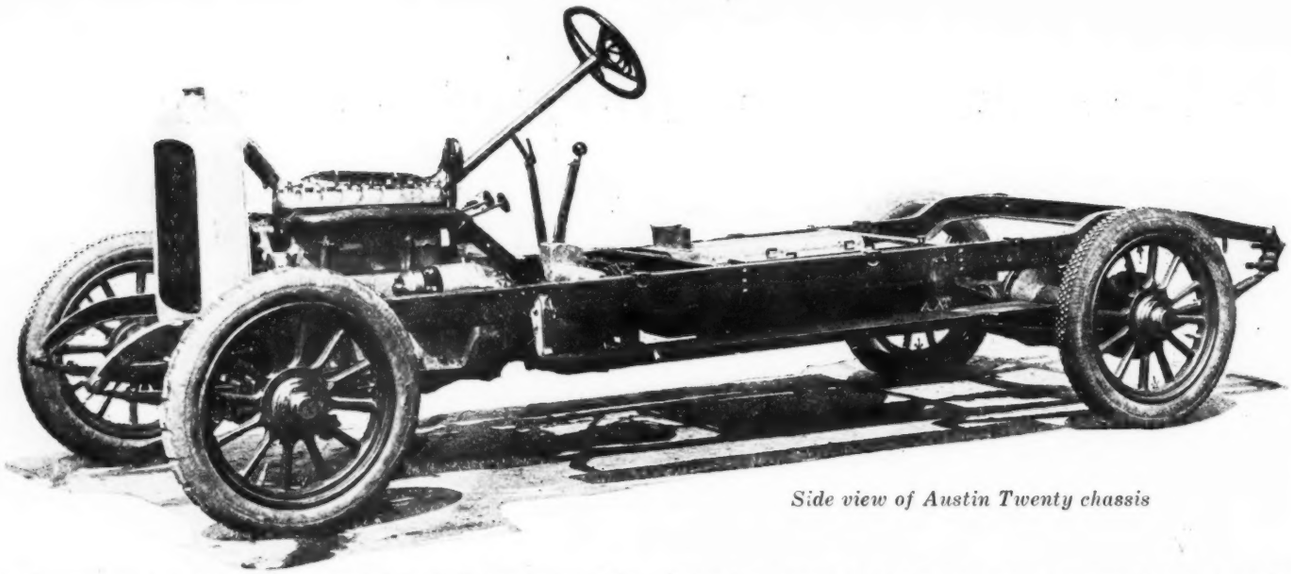
Wheelbase	10 ft., 9 in.
Tread	4 ft., 8 in.
Width overall	5 ft., 2½ in.
Length overall	14 ft., 11 in.
Body space	8 ft., 7½ in.
Distance from rear of dashboard to center of rear axle	7 ft., 11 in.
Tires, standard model	32 x 4¾ in.
Colonial model	36 x 4 in.
Ground clearance, standard model	9 in.
Colonial model	11 in.
Approximate weight of chassis	2000 lb.
Bore and stroke	3¾ x 5 in.
R. A. C. rating	22.4 hp.
B.-hp. of engine at 2000 r.p.m.	45.

Fuel is fed by gravity through an Autovac secondary tank. The main fuel supply is carried in a 15-gal. tank supported on substantial brackets attached to the cross-members in the center of the frame. A fuel lever indicator is supplied, and an outlet pipe fitted at the bottom. Ample filling arrangements and a large strainer are provided in an accessible position under the front seat. A combined electric self-starter and lighting equipment is provided, and there is also a detachable starting handle for use in case of emergency.

A single-plate pattern clutch with asbestos friction facing is fitted. The gearbox gives four speeds forward and



Austin touring car with top up



Side view of Austin Twenty chassis

one reverse, the shafts being carried on ball bearings. The speedometer is gear-driven from the change speedbox. The change speed is operated by a lever through a gate, which, with the brake lever, is fixed in a central position. The engine and gearbox form one unit with three-point suspension on the frame.

The rear axle is of the three-quarter floating type, the axle housing carrying the rear wheels on ball bearings, thus relieving the shafts of the chassis weight. The main driving gears are of the helical bevel type.

The I-section front axle, knuckle and knuckle arms are forged of high-grade steel, carefully tempered so as to resist fatigue. The front wheels run on roller bearings with ball thrust. The steering is of the worm-and-sector type, with a stationary outer column supported from the cowl, and is fitted with a 17-in. wheel, with the throttle, ignition, and extra air levers on a stationary quadrant.

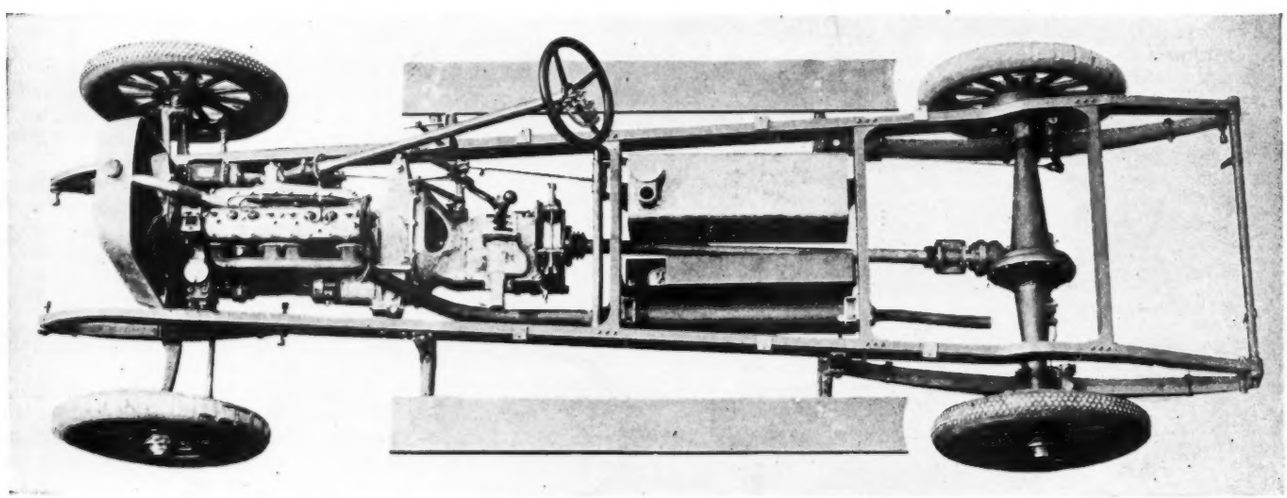
The chassis springs are semi-elliptic, the rear being of the underslung type 60 in. long, while the front are 36 in. long. Special provision is made to prevent rust between the leaves.

Metal-to-metal internal expanding brakes act on drums on the rear wheels and contracting shoes faced with asbestos fabric close upon a drum mounted on the third motion shaft at the rear of the gearbox. The car is fitted with Austin detachable artillery wheels as standard. One spare wheel with studded tire is also provided. Three separate types of body are to be mounted on the chassis—the standard model open touring car with top, a four-seated coupé, and a landaulet.

The standard touring model is an elegant piece of work. The top, when not down, is tucked away into a neat, well-drained receptacle. The front seat is arranged to slide backward or forward and is adjustable to any angle. There is an all-metal framed windshield with both top and bottom halves deflecting. The electric lighting outfit includes two powerful headlamps and side and tail lamps. A specially arranged tire carrier with metal cover is fitted at the rear and can accommodate two spare wheels. All doors are fitted with interior locks and concealed hinges. The general finish is in nickel and the body work is painted in one of three standard colors, gray, dark green or blue, with upholstery to match.

The coupé is a roomy four-seated car with streamline body accommodating two passengers at the rear and two at the front, the rear seats being fitted with arm rests at each side. The top is of black leather and is capable of being raised with automatic raising and lowering gear, while the door windows are in two parts arranged to slide horizontally, the frames thus falling inside the doors when not in use. A window is also provided at the back of the top. The lighting arrangements and general equipment resemble those of the touring car.

Features of the landaulet model include a semi-domed roof with fixed sloping canopy, automatic folding head with cant rail and concealed head joints. All doors are fitted with concealed hinges, large lever locks, and silent dovetails. Easily raised frameless and noiseless windows are fitted to doors and quarters. A specially arranged tire carrier with metal cover is fitted at the rear, and can accommodate two spare wheels. The tool equipment includes a complete set for average running, carried at the rear of the car, in a new type toolbox, and some special tools for use in the garage.



Plan of chassis. Note location of fuel tank (vacuum feed) and storage battery

F-5-L Navy Flying Boat

Details of Flying Controls and Method of Hook-Up—Weight and Percentage of Weight of Every Component

By S. T. Williams
Assistant Chief Engineer, Naval Aircraft Factory, Philadelphia

PART IV

IN the previous three articles describing this boat, the various outstanding features of the hull, wing panels, engine mounting and gasoline systems were outlined. The boat is a twin-engined tractor biplane equipped with Liberty engines. It has a wing span of 103 ft., with wings 8 ft. wide, and a boat hull 45 ft. long and 10 ft. wide. The total flying weight is 7 tons and the cruising radius is 10½ hours as a fighter and 8½ hours as a bomber.

The outstanding features of the flying controls are the laminated-yoke dual elevator and aileron control mounting, and the adjustable rudder bar installation.

The yoke itself is built up of ⅛-in. laminations of ash, glued and riveted together, making a strong and light construction. Each end is extended to form the elevator throw, and the aileron control wheels are mounted on brackets at the top.

These wheels are connected by an endless chain, from the middle of the lower part of which are taken the aileron control wires. The cross tube is integral with the yoke, and the whole swings on bearings at the hull sides.

In addition to lightness of construction, rigidity, and simplicity of wiring, this control affords a maximum amount of room for passing from the front to the rear cockpit, and does not interfere with the legs of the pilots as does a post type control.

Originally, adjustment of the distance between the pilot and the rudder bars was effected by shift-

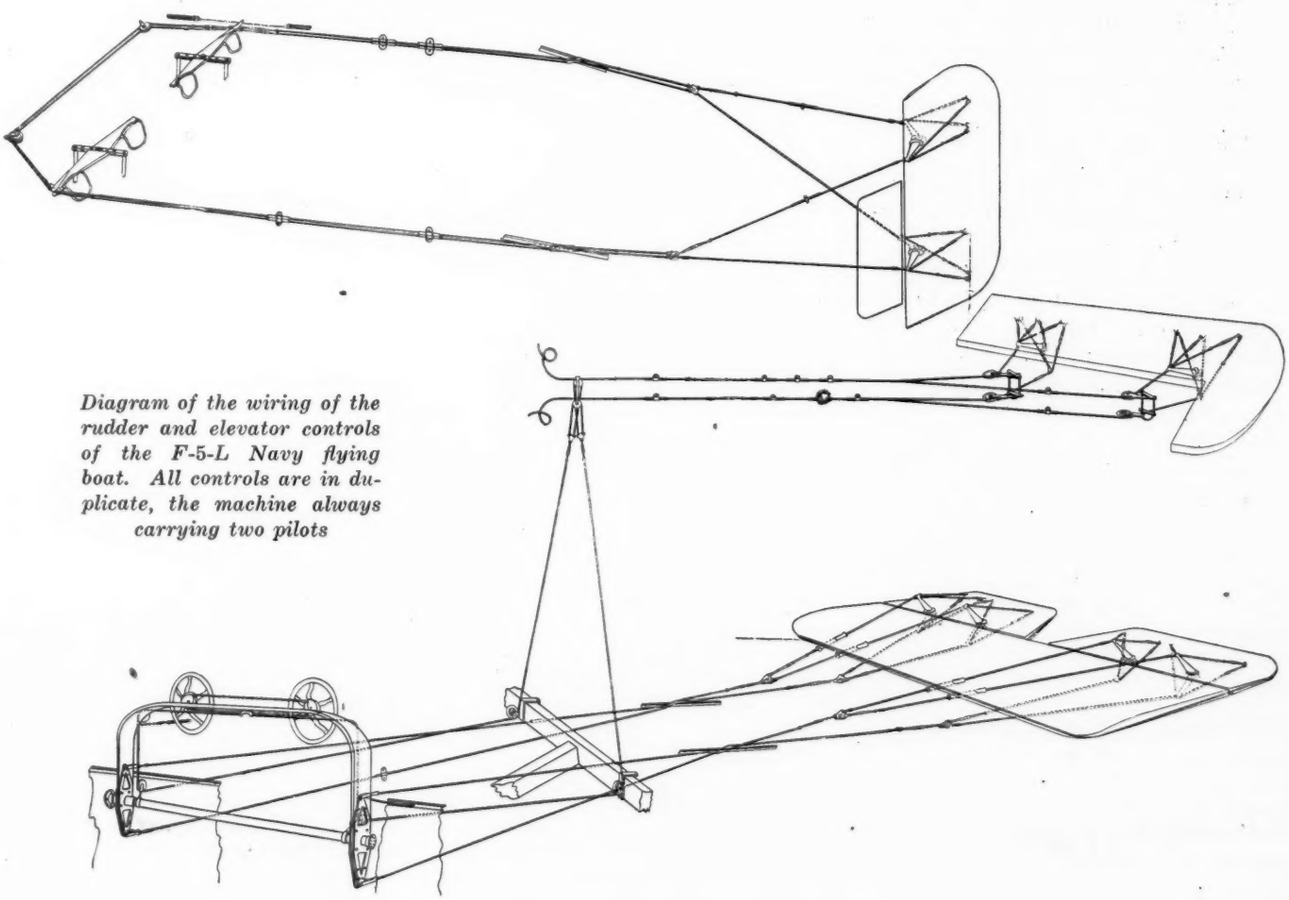


Diagram of the wiring of the rudder and elevator controls of the F-5-L Navy flying boat. All controls are in duplicate, the machine always carrying two pilots

ing the seat. But this also brought the control wheel closer, and the installation was complicated. Adjustment on this plane is effected by shifting the rudder bar bodily fore and aft the required amount.

The rudder bar is carried between two straps that are supported on a tubular framework in front of the pilots. These straps have a series of holes, and the rudder bar may be set to swing on a pin passed through any one of these. A similar adjustment permits the outer end of the bar to be set properly in connection with the rudder cable. As these pins are set in place by a small brass cotter, any desired setting can be made quickly.

Under severe flying conditions, or in the case of tail or nose heaviness, it is sometimes necessary for the pilot to exert a continuous pressure on the controls. On the elevator or rudder controls, this continuous pressure may be applied at will, in any desired amount through rubber cords called "bungies."

The complete bungy is simply two pieces of rubber cable, connected by a small chain, and having both ends secured to the hull sides. The chain passes adjacent to the control it governs, and is hooked to it at will with a snap hook. The pressure is applied to the control by extending the rubber cable before the attachment of the chain.

All control cables are carried on brass ball-bearing sheaves, and the sheave housings are fitted with guards to prevent the cables from coming off. With the exception of the point where the aileron cables pass through the upper wing, all control cables are open to inspection.

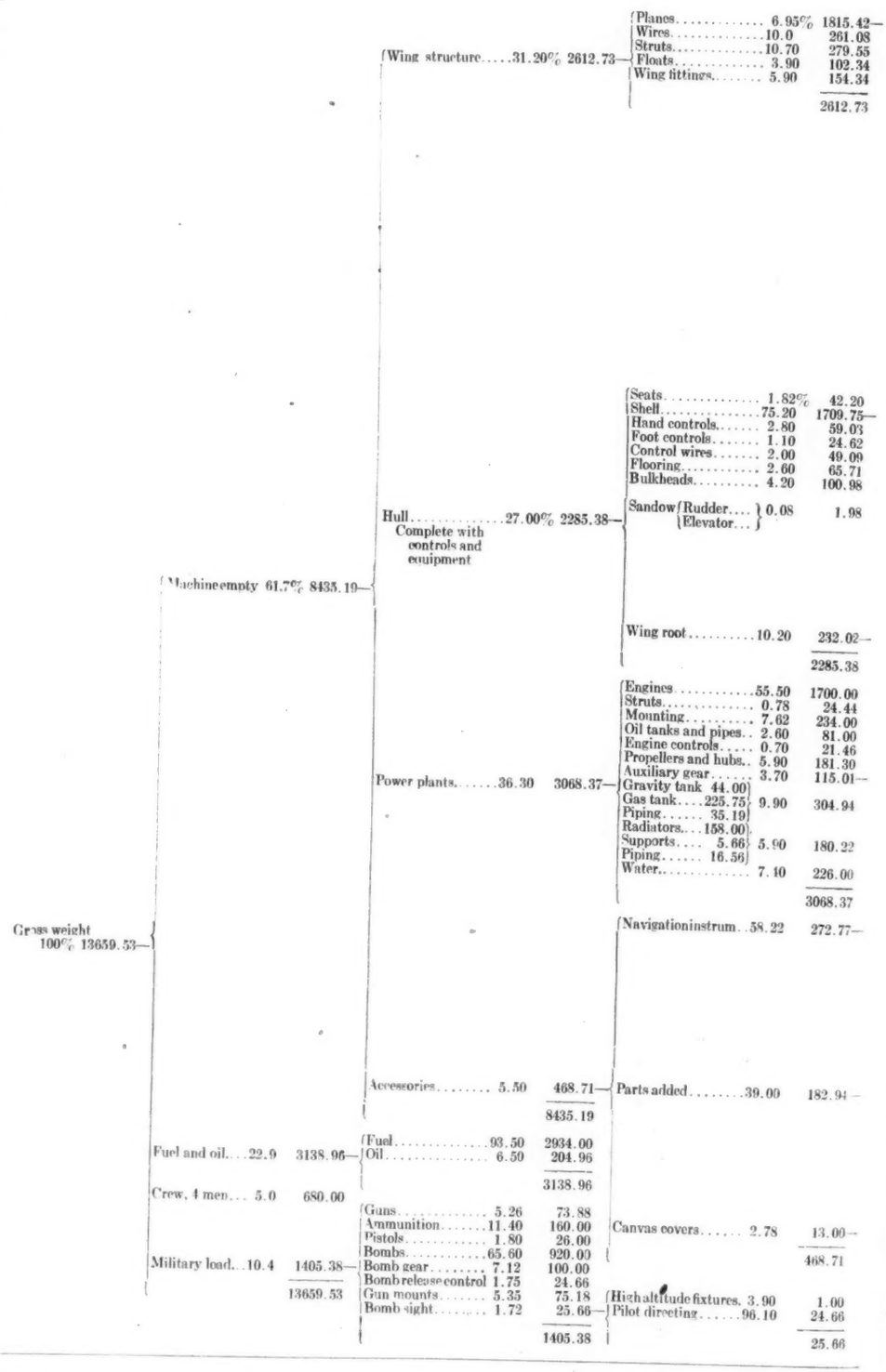
Steaming Green Lumber

SATURATED steam as a means of alleviating the tendencies of green lumber to honey-comb in the kiln has for some time been successfully applied in the commercial drying of heavy vehicle stock. Under intelligent control, such treatment has meant the difference between success and failure in many kiln runs. It has frequently afforded the means of overcoming discrepancies in operation or misjudgments as to the ability of stock to withstand rigid drying conditions.

So far, however, the steaming treatment has been confined to straight stock. The contention has always been that bent stock, such as rims, should not be steamed after removal from the form, experience indicating that stock so treated would tend to straighten out to its original shape. The kiln drying of heavy bent rims has been carried on, therefore, without resorting to steaming to remove casehardening and other defects of drying.

Weight Chart of Experimental

Corrected for Recent



Model F-5-L Flying Boat

Changes in Equipment

Top planes	24.40%	441.99				Vertical	35.6%	54.25
Extensions	12.95	235.24				Horizontal	64.4	98.39
Center panel	7.09	127.29	Stabilizers	47.70%	152.64			152.64
Lower planes	29.70	537.91						
Ailerons	7.33	132.79				Port	50.0	29.84
Non-skids	1.10	20.00				Starboard	50.0	29.84
Tail unit	17.52	320.20	Elevators	18.70	59.68			59.68
		1815.42	Rudder	12.80	41.33			
			Tail stays	20.80	66.55			
					320.20			
			Longerons	137.90				
			Keel	47.29				
			Keelson	50.89	31.00	241.36		
			Sternpost	5.28				
			Bracing nose	2.24				
			Bracing w. r.	60.21	7.90	62.45		
			Stringers	71.48				
			Floors	97.03	32.90	257.55		
Skeleton	45.80	782.46	Fin timbers	89.04			Hull wires	29.3	26.05
			Metal parts	11.40		89.02	Fittings	70.7	62.97
Paint	2.10	36.00							89.02
Hood	7.10	121.12							
							Metal	41.7	55.02
Fabric	0.64	10.68	Stanchions	16.80		132.08	Wood	58.3	77.06
						782.46			132.08
			Sides	13.10		83.82			
			Fin decking	12.90		82.32	Planking	78.0	369.28
Skin	37.40	640.22	Bottom	74.00		474.08	Steps	22.0	104.80
						640.22			474.08
			False keel	2.17		2.59			
			Tank supports	41.60		49.58			
			Doors and supports	14.60		17.48			
			Aft cross members (tail fin)	6.53		7.79			
Sundries	6.96	119.27	Ammunition boxes	19.60		23.35			
		1709.75	Miscellaneous	15.50		18.48			
						119.27			
Center bracing (wood)	12.20	28.36							
Spars	26.80	61.91							
Compression tubes	6.00	14.18							
Ribs, end and covering	35.20	81.84							
Fittings	19.80	45.73							
		232.02							
Tachometers (2)	9.50	10.92							
Gravity fan pumps	12.60	14.52							
Hand gas pump	4.70	5.41							
Thermometers (2)	2.20	2.52							
Oil gauges (2)	5.60	6.46							
Hand starters (2)	33.80	38.86							
Storage batteries (2)	18.20	20.90							
Ampere switches (2)	4.00	4.68							
Gas gauges (4)	5.90	6.75							
Miscellaneous	3.50	3.99							
		115.01							
Wireless	91.90	251.74							
Compass (2)	2.65	6.14							
Air speed line	4.15	11.32							
Inclinometer	0.48	1.32							
Clock	0.48	1.32							
Altimeter	0.34	0.93							
		272.77							
Communicating set and battery	5.47	10.00							
Pyrene ext. and brackets (7)	25.16	46.27							
Hand bilge pump, complete	8.21	14.97							
Liberty tool kit	16.96	31.00							
Life preservers (5)	5.47	10.00							
Goggles	0.82	1.50							
Windshield	2.02	3.70							
Safety belt-gunner	1.92	3.50							
Medical outfit, food and water	27.40	50.00							
Binoculars	1.10	2.00							
Chart board and pigeon outfit	5.47	10.00							
		182.94							
Propeller covers	53.90	7.00							
Gun cockpit cover, F.W.D.	46.10	6.00							
Gun cockpit cover, main									
F.W.D. cockpit cover									
		13.00							

Recent experiments conducted under the direction of the Forest Products Laboratory have shown that judicious steaming of heavy bent vehicle stock results in a considerably improved product, and that the operation can be accomplished without serious effect upon the curvature. Careful judgment is necessary, however, as it is a very easy matter to ruin the entire charge by too severe treatment. Contrary to the common impression, this steaming has been done at high temperatures (150 to 180 deg. Fahr.) and for short periods (½ to 3 hours), the temperature and time varying according to the requirements

Copper Alloys

A PAPER on the above subject by Dr. W. Rosenhain was read at the annual general meeting of the Institute of Metals in London on March 25. It describes the method of preparation of a number of copper alloys and gives the results of tensile and hardness tests carried out on them. The alloys were intended to meet very stringent requirements involving extensive cold-working, so that high tensile strength with great ductility was aimed at.

The alloys dealt with fall into two main classes. The first class consists of alloys of copper with aluminum, with manganese, and with both aluminum and manganese. Difficulties were experienced in casting these alloys into slabs, and special methods of casting were adopted. A process sometimes known as "pressure casting," which has been developed and patented by F. Tomlinson, was eventually adapted for use with these alloys and proved very successful. In this method the liquid metal is forced, by means of externally applied air pressure, through a feeder tube dipping into the molten metal nearly to the bottom of the crucible and communicating with the bottom of the mold. Alloys cast by this method were subsequently rolled into strips. The results of tensile tests show that a very high degree of ductility can be obtained, together with considerable tensile strength, by the use of aluminum, or aluminum plus manganese. For example, the alloy containing 7 per cent aluminum without manganese has a tensile strength of just under 80,000 lb. per sq. in., with an elongation of 17.5 per cent in the "as rolled" condition, while after annealing it still has a tensile strength of 55,000 lb. per sq. in. and the remarkable elongation of 71 per cent.

The second class consists of alloys containing no aluminum: these are mainly combinations of manganese and zinc, or nickel and zinc, with copper. They were cast successfully with the aid of borax as a flux and and were subsequently rolled into thin strips of excellent quality. Of this series the strongest alloy is that containing 3 per cent manganese and 10 per cent zinc, which, in the cold rolled condition, has a tensile strength of 94,000 lb. per sq. in., with an elongation of 3 per cent, and in the annealed condition a tensile strength of 46,000 lb. per sq. in., with 35 per cent elongation.

Suggested Touring Sedan

Single or Double Compartment, with Baggage Space and Rear Trunk—Straight-Effect Body Lines

By George J. Mercer

THE inside-drive sedan type is the most popular custom order body, and any builder will confirm the statement that more than half of all the orders for special bodies are of this class of design. For a while the body with the removable pillars, in which the side-window openings are all made into one, had a large following, but that has lessened each year for two seasons, and to-day the orders for this design are negligible.

Close-coupled, compact bodies are the rule now. The car owner is buying for himself rather than for his friends' convenience, and the snug, sensibly proportioned body does have a degree of style and smartness to it that the large buslike looking bodies never can have.

The design illustrated is for four passengers, including the driver, and has a division with a large glass that drops entirely down, so that it can be either a two or a one-compartment interior. For an emergency, an extra seat, close to the partition, and so that the one extra passenger can sit across the car, is quite within reason, as the proportions will permit of this.

This design is specially suitable for touring and vacation trips, as provision is made to carry luggage and wraps. The rail on the roof is only one bar high. It is intended to be used for carrying spare wraps, coats, robes, etc., inclosed in a rubber or tarpaulin bag, and is never intended that anything other than such articles should be put on top. There is room inside the body, forward of the feet, for such satchels and bags as will be needed, in addition to the trunk at the rear, which trunk is back of the tire, and in a measure is inaccessible; but it is the best place for it. As it will not be needed except when long stops are made, it can be lifted off and taken to the room of the hotel. Used in this way, it will have a real value, and will hold those additional necessities needed en route.

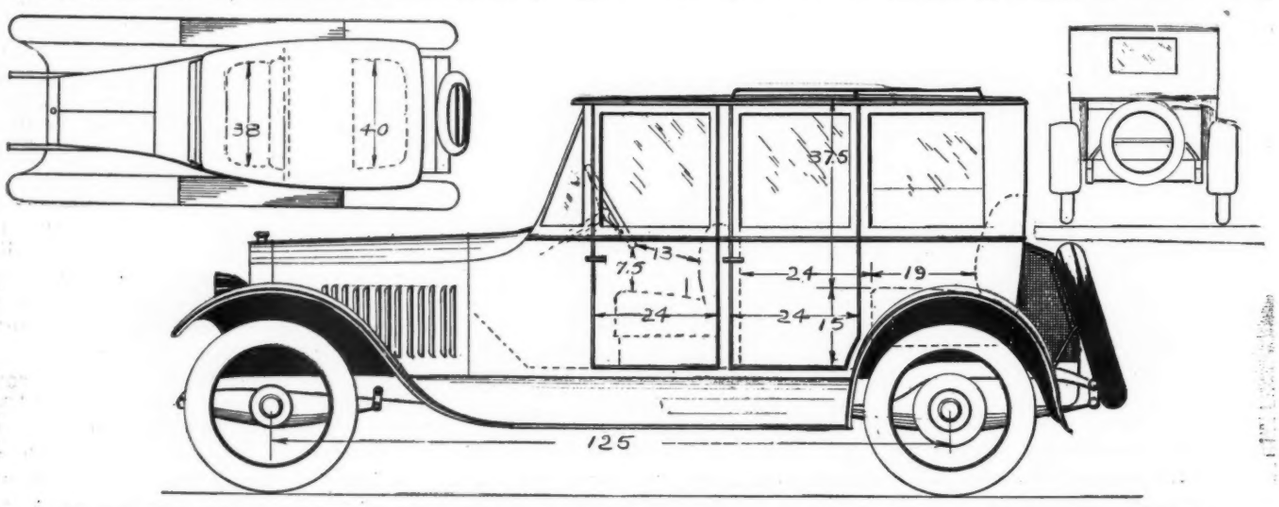
The object aimed at in this design is to get the straight effect throughout, and not only the horizontal but the perpendicular lines of the sides and back. These upright lines can never be actually straight. If so, the body would look too much like a box if there were not some curve or turnunder to relieve the flat look. The body must be narrower at the bottom than at the top to reduce weight and conform to the chassis width.

Another fact not so generally known, except to the trade, is that the surface of a body, when painted and varnished, always looks a trifle flatter than it actually is, and the varnished surface looks better when convex than when flat; hence the flat-sided and flat-backed body really has more turnunder sweep than is supposed.

The intention of the designer is to have the body straight, yet flat-looking, and that is one of the reasons that has helped to bring in the small bodies. A close-coupled narrow body can incorporate the requisite appearance qualities because of its size.

The design illustrated by side, back and top views is intended for a chassis of 125 in. wheel base, with 32 by 4½ tires. The angle of the front windshield post is 22 deg. from perpendicular, and this is made to blend well with the line of the engine hood, both on the top and at the line of the post.

The construction of this body is plain, the only moldings being around the doors, the middle horizontal, and the drip at the top. Both the horizontal moldings extend entirely around the back, thus permitting the joining of the upper and lower panels without welding. The roof is of laminated wood, and covered with cloth in the customary coachmaker's method. Metal roofs are being used quite extensively, but to use metal the roof should be more convex than this design, the reason being that metal requires to be strained in order to lay tight. When flat it will whip, although on this body the slats to protect the roof from damage where used as carrying



Touring Sedan body with four doors. Front windows operated by regulators. Rear side quarters have concealed lift straps

space would be a sufficient binder to keep any metal from giving trouble through moving. These slats are wood, put on with screws after the top surface has been well protected with paint. They simply keep the articles that may be carried on the top from defacing the protecting paint. The rail, three-eighths round, and supported by standards at the corners and in the middle of each space, is only high enough to secure the straps holding the baggage.

The trunk on the rear is of the customary design, but must be made to fit the job, and is intended to be lifted off when taking articles from it. The extra tire is released from its holder when the trunk is removed.

The outside line of the body is illustrated to good effect on the plan view. This effect is pleasing, and the aim is accomplished in having a smooth extended line from the radiator to the end of the body. The radius of the rear corner is less than usual. It is a tendency to have the rear corner of shorter radius than formerly; in fact, there are more square-cornered rears than since the early days of the automobile. Personally, I think that a square rear corner is not suitable for a body as large as this design. The radius may be only 1 in., and it will look well, but a square corner is suitable only for a small two-passenger job. It has a balance on a small body that is not needed on a larger body.

The illustration shows four doors, with windows operated by regulators, except the rear side quarters, which have concealed lift straps and the glass drops to the line indicated. The other windows all drop flush. The triangular one at the front and the back window are stationary.

The front windshield is two-piece, the upper one swinging outward and the lower part being stationary. There is a tendency at present to have the lower part of the glass swing inward to serve as a ventilator, but it stands to reason that this will surely let in the rain, and it can be arranged by having a ventilator on top of the cowl, which can be made watertight. The ventilator on the side of the cowl has been discontinued on account of the hot gases from the engine-hood louvres coming in.

The metal used on this body must be aluminum sheet for custom work, and the entire surface is so covered except the roof.

The essential dimensions for comparative tests with another body already built, to see if they are right for the person interested, are given on the several views. These dimensions are for the average person, and are intended for comfort and luxurious thick trimmings.

A sport type would be 2 or more inches lower, as the fancy of the owner dictated, and could be 2 in. narrower for the same class of customer. Sensible proportions, however, are best adapted to bring out harmonious lines, as this design illustrates.

The doors are hinged to open forward, and exposed coach hinges are used to save thickness in the pillars. Bar handles and locks on each right-side door should be specified. The windows are proof against opening from the outside, where regulators are used. The quarter windows must have a fastener to prevent opening from the outside.

The most popular color scheme has been Rolls-Royce blue and hair-line yellow striping, with silver-finish door handles and lamps. A radiator of silver finish would add beauty and harmony to the car.

Interior trimmings have been quite modest in design and color, and a gray with small black markings will go well with this color scheme.

Liberty Carbureter Gasoline Strainer

ON all the Liberty engines shipped after Nov. 10, 1918, a new form of carbureter gasoline strainer was used. There had been some difficulty experienced through dirt working into the carbureter jets, and disturbing the measured flow necessary for the best results. This occurred because there was no strainer in the gasoline system between the tank and the carbureter, and the gasoline being in contact with the rubber hose, rotted this after a time, causing particles of rubber to be carried along into the carbureter.

To avoid this difficulty a gasoline strainer was designed to filter the gasoline entering the float chamber and to make an easy mechanical break-down for removing the carbureter. This strainer incorporates a bucket screen. The gasoline entering from the top, filters through the screen, while the dirt is caught in the bottom of the bucket, which can easily be removed and emptied at intervals.

As a further protection against rubber particles, a brass hose liner or "olive" was inserted in the rubber hose. This strengthens the hose and acts as a spacer between the supply pipe and the strainer intake. The tapered ends of the olive fit into the beveled ends of the pipe and strainer, preventing the gasoline coming into direot contact with the rubber. The entire layout and method of assembly is shown in the sketch herewith.

To install the strainer assembly, it is only necessary to remove the gasoline connection from the carbureter bowl and screw the strainer in its place. The gas line attaches to the gasoline connection at the top of the strainer by means of the rubber hose containing the brass hose liner. Suitable clamps are supplied with the service set.

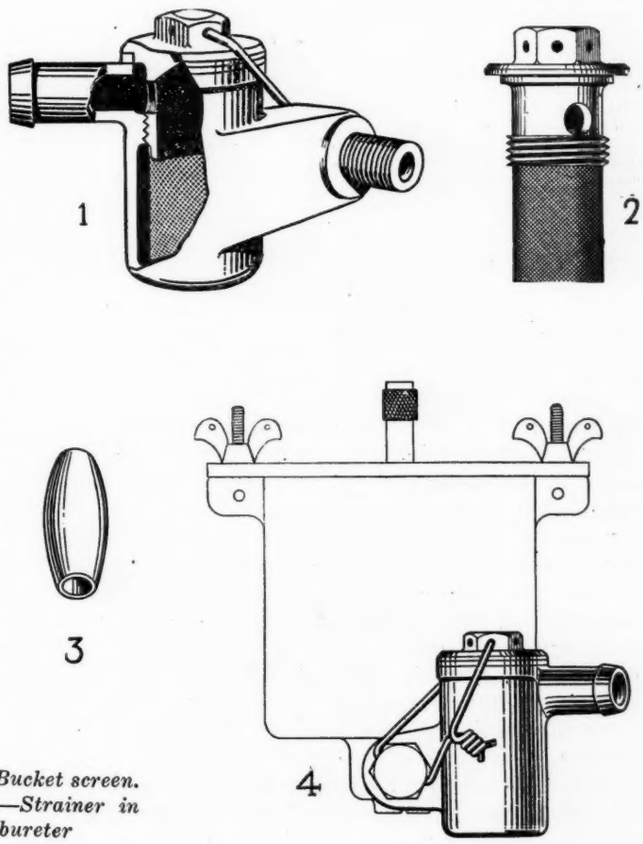


Fig. 1—Section through strainer. Fig. 2—Bucket screen. Fig. 3—Olive rubber hose liner. Fig. 4—Strainer in position on float bowl of Zenith carbureter

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The AUTOMOBILE

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High Duty to Bar American Automobiles

DURING the past two years we have heard a great deal about the war after the war, which phrase was generally used to convey the meaning that after the cessation of military operations hostilities would be continued by means of trade boycotts, discriminatory tariffs and other suitable means, the inference being that the line-up of Powers would be the same as in the military struggle. But recent news reports from Paris suggest that in the automobile field at least the phrase may soon come to have an entirely different significance.

As duly recorded in last week's issue of AUTOMOTIVE INDUSTRIES, representatives of the automobile manufacturing industries of all the Allied countries held a convention in Paris recently at which post-war policies were discussed. Following the practice of another famous convention now sitting in Paris, the sessions were held in star chamber, and a properly expurgated official report was issued. It has leaked out, however, that the convention decided on a tariff duty on automobiles of 10 per cent between the different European countries and a duty of 45 per cent in Europe against American automobiles.

At first sight this appears alarming. Fortunately it is not the automobile industries of European countries which make the tariff laws of those countries. The only thing the Paris congress can do is to urge upon its members to recommend to their respective governments that certain steps be taken with respect to the taxation of automobile imports. Inasmuch as the automobile manufacturers are not disinterested and unbiased persons it is rather doubtful whether much heed will be paid to this advice by the legislatures.

It may be that the idea in holding the convention at Paris at this time was to exert some influence on the Peace Congress, as the latter is to consider post-war economic questions among others, but it is greatly to be doubted whether the Peace Congress will stop to consider such detail matters as automobile duties. If it deals with the subject of duties at all it will probably formulate some general rules which are applicable to all lines of merchandise alike.

It appears that the Paris Congress of Automobile Manufacturers is to continue the work of the former Association Internationale des Chambres Syndicales d'Automobile Reconnues. This was a rather loose organization with headquarters in Paris, the secretaryship being identical with that of the French Automobile Manufacturers' Association. The chief function of the association in the past was to assist in the dating of automobile shows so as to obviate interferences. At one time also a decision against participation in races was made. No really active organization ever existed, but on a few occasions representatives of the foreign automobile industries were called to Paris to discuss certain topics of mutual interest. As American manufacturers previous to the war rarely exhibited at European shows and took no part in European automobile races our N. A. C. C. nor its predecessor was ever a member of the International Association.

The action taken by the Paris congress reflects the fear of American competition. At the present time automobile imports are totally prohibited in both England and France, but it is realized that these prohibitions were war measures, and that although they are continued in force pending the reconversion of the home industries from a war to a peace basis they cannot be continued indefinitely. The doors must be opened again before long and the terms of admission to be offered to American machines is a point of great importance. Whatever the effect of the resolution may be on future tariff legislation, it should not be lost upon the great importing markets of South America, Africa and Australia. Manufacturers of the different Allied nations have practically gone on record that they consider themselves to be on a sufficiently even footing to enable all of them to agree to a reciprocity measure, but that the United States must not be admitted to the pact.

Quality in Inclosed Cars

SOME years ago closed bodies were fitted only to high-grade chassis, and the possession of a closed car was regarded as a sign of affluence. More recently, however, the manufacturers of low-priced cars have responded to the demand for closed vehicles suitable for all-year use and have brought out designs which are very attractive in appearance. There is considerable demand for these vehicles, which commend themselves especially to elderly people and to families in which there are persons not in the best of health. That these vehicles make a strong appeal was noticeable at last winter's show, where they were usually surrounded by interested visitors.

Unfortunately, the interior finish and fittings of the coupés and sedans offered are not always what might be anticipated from the attractive lines and the rather high price. These are defects which should be promptly remedied, if it is desired to build up a permanent trade in these models. It should be remembered that the owners of closed cars see much more of the interior than of the exterior of their vehicles, and any unsightliness or cheapness in the interior finish will soon offend them and cause them to become dissatisfied. Take, for instance, the matter of floor mats. These often have a cheap appearance when new and soon wear threadbare. Metalwork sometimes shows rough corners and badly finished surfaces, and the interior paint work is of a character that would not pass inspection in a first-class shop. It may well be that a purchaser who has been captivated by the attractive lines of the vehicle soon becomes disgusted with the shabby interior and develops a grudge against the manufacturer.

During the war many things were excusable, as most of the best mechanics were on Government work and good materials were hard to get, but now that the war is over and the restrictions are removed there should be a general improvement in the quality of construction, and especially in the interior finish and fittings of moderate-priced inclosed cars.

The Cyclonette

A FORM of light motor vehicle that has met with considerable success in Continental Europe but has never been introduced here is the cyclonette, which is in a way a cross between a motorcycle and a light car. It differs from a motorcycle in that one does not ride astride it, but it resembles a motorcycle in having a tubular frame, a light air-cooled engine, suspension wire wheels, etc. The machine would seem to fill a demand similar to our motorcycle with side car, over which it would appear to have certain advantages.

In the cyclonette the engine is mounted on the front fork, with which it turns in steering, and it drives directly to the single front wheel. Evidently the conditions are unusually favorable to effective air cooling. There are seats for two between the two rear wheels, which are located rather low, giving the vehicle a high degree of stability. There is no side draft as in a side car, and the driver is certainly seated more comfortably.

The weak point of the cyclonette appears to be that the proportion of the total weight that is supported by the driving wheel is rather small especially in climbing steep grades, so that it might be difficult to get traction if the road surface was at all slippery. For use in fairly level districts and possibly for taxicab service in cities a vehicle of the cyclonette type may have a future.

Air Code Should Be Criticised

THE formulation of a preliminary international air code at Paris should be given the attention of all who are interested in the future of aviation. The primary code is purposely intended for criticism and revision. It is given to the world so that it can be carefully considered and constructively criticised in order that an intelligent, comprehensive and complete international code can be finally arranged.

Consequently, it is to the professional pilot, individual airplane owner, aeronautical engineer, airplane engine builder, plane maker, manufacturer of dirigibles and producer of balloons that the interministerial commission addresses itself. And it is to the interest of each of these to examine the report carefully and offer suggestions. There is no question but what the experience of operators and engineers can be used to revise these rules advantageously.

There are, without doubt, errors in the preliminary draft. For example, there is the authority granted by the present code to aeronautic associations to examine pilots and issue licenses which can very easily lead to a monopoly and complete control of aviation in any country in which such associations exist.

AUTOMOTIVE INDUSTRIES will be pleased to receive any suggestions for the revision of the new regulations as published in this week's issue, and will forward them to the Inter-Ministerial Commission of Civil Aeronautics.

Latest News of the

Government Insisting on Quick Settlement

Contractor Must File Claims by June 30 or Submit Them to Slow Court of Claims

DETROIT, April 8—Manufacturers must present their war claims before June 30. Settlement of the $1,500,000,000 war claims in the Detroit district continues to progress slowly, so slowly in fact that the local claim adjustment boards have issued a warning designed to stir manufacturers tardy in filing their claims into renewed activity.

On and after June 30 local boards will receive no more claims. Contractors with informal contracts must file before that date or their claims automatically became invalid. Contractors with formal claims will be denied the assistance of the claims board after that date and must seek redress in the Court of Claims at Washington.

Inasmuch as the Court of Claims is a slow-working organization, only last week approving a claim for $1,800 filed in 1876, and still having many civil war claims pending, the disadvantage of being obliged to go before this court for settlement is too plainly apparent for the tardy contractor to fail to perceive and the government claim officials here hope the warning will cause him to double his accounting force if necessary to get his documents ready for immediate filing with the respective boards.

Ordnance and quartermaster claim boards thought the bulk of their adjustment work would be settled by April 1. April 1 is here and passed, however, and figures at ordnance headquarters show that on April 1 only 13 per cent of the total 270 claims have been passed and approved by Washington. Approximately 25 per cent have been passed by the local board from 58 per cent of the total which have been filed.

Although the ordnance, quartermaster and aircraft claims boards have several hundred experts at work aiding the manufacturers in preparing reports, inventories and other data required by the government before settlement is made, the work continues to be slow, owing to inability of the contractors themselves to produce the necessary information. Poor accounting and cost system work in the plants is the cause, and in numerous instances the government experts have been obliged to take the books of firms and audit them completely from the day the first purchase was made for contract work until the last job was completed.

The Aircraft Claims Board is making better progress than either the quartermaster or ordnance divisions. This is due to less rigid requirements and the fact that the companies with which this department is dealing are larger and better organized than the others. This board has passed and received settlement on approximately 55 per cent of its total claims, to date having paid out in the neighborhood of $90,000,000. Seven hundred claims remain to be filed and passed upon, however, among them being those of the Packard, Lincoln, Ford, Fisher Body, Cadillac, Buick, Willys-Overland and C. R. Wilson Body Co.

The majority of the sub-contractors' claims have been adjusted by this board, and it is now devoting its entire effort in getting the main contracts in line for adjustment.

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Unsettled Steel Price Halts Buying

Makers Waiting for Agreement Between Railroads and Steel Committee and Doing Little

DETROIT, April 7—Until the railroad administration and the steel committee agree on the price the railroads must pay for steel, the automotive industry will continue its present hand-to-mouth buying policies. While the recent price decision fixing a minimum steel price caused increased buying activity, the larger automotive plants continue to buy just what steel they need when they need it. But when the railroads, the nation's greatest steel consumers, get into the market, there will be a demand for steel sufficient to force the automobile, truck, tractor and parts makers to purchase in greater quantity.

When steel prices were set three weeks ago, scores of companies placed orders they had been holding back since Dec. 31, assured that the price would probably take a drop when the cost was fixed April 1, and holding that business conditions during the first few months of the year, would be far below normal, owing to cancellation of government contracts and the general reconstruction depression following the termination of the war. The companies arranged their production schedules for the first few months in accordance with this belief but planned for increased production from April on. When the steel price was fixed the companies were obliged to release these orders which they were withholding, and they did this knowing that from a business standpoint it would be impossible to keep them pigeon-holed much longer. The release of these orders stimulated the market to some extent. These releases were bidding fair to create a general buying movement, and this movement was gaining considerable momentum until the railroad administration upset the equilibrium of the market by holding out for a still lower price.

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Metropolitan Section of S. A. E. Discusses Heavy Oil Engine

NEW YORK, April 10—Heavy oil engines, including both the hot surface and the Diesel type, were the subject of discussion at last night's joint meeting of the New York Branch of the American Body of Mechanical Engineers and the Metropolitan Section of the Society of Automotive Engineers, which was held at the Automobile Club of America. Dr. Chas. E. Lucke of Columbia University presided. Among the papers presented was one by Mr. Dean of the Bureau of Mines on the fuel situation, which handled the subject in a statistical manner, and one by J. H. Hunt of the Dayton Electrical Laboratories Co., dealing with some experiments on fuels carried out by the Delco organization. The other papers related to the hot surface type engine and to the Diesel marine and Diesel stationary engines respectively. Little time was left for discussion.

One point brought out at the meeting was that the more abundant the fuel the more difficult it is to build an engine suitable for burning it. In the paper by Mr. Dean it was pointed out that the constituents of crude petroleum suitable for fuel purposes are separated by distillation into five parts, namely, gasoline, kerosene, gas oil (or fuel oil distillate) and light and heavy residual fuel oils. The production of these various fuels for 1918 had just been determined, although the figures available were only the preliminary ones. These were as follows: Gasoline, 3.6 billion gallons; kerosene, 1.8 billion gallons; fuel oil 7.3 billion gallons. No official figures were yet to hand as to the proportions of the different grades of fuel oil, but it was estimated that the total was made up of 1.5 billion gallons of gas oil; 2.0 billion gallons of light and 3.8 billion gallons of heavy residual oil.

Automotive Industries

Post Office Wants 10 Planes

Asks Bids on Multi-engined Machines of Commercial Type—The Specifications

WASHINGTON, April 8—New specifications for ten multi-engine airplanes of strictly commercial type and particularly adapted for carrying mail were issued to-day by the Post Office Department, which is asking manufacturers for bids. The specifications are general, allowing the manufacturers wide latitude of design and construction, and are the result of many views gathered from pilots, airplane makers, aeronautical engineers and manufacturers. Consideration will be given to planes of two, three or more engines connected on one shaft or set in the wings or central fuselage, or both, and with the minimum capacity of 1500 lb. of mail. Preference, however, will be given to planes capable of carrying 2000 to 3000 lb.

The Post Office is especially desirous of securing a plane with a very low landing speed either with speed structurally inherent in the machine or accomplished mechanically, with a cruising speed of 90 to 100 m.p.h. and a cruising radius of about 6 hr. with normal load. A service ceiling of 15,000 ft. is desired. If the planes are built around Liberty or Hispano-Suiza engines the department will furnish the engines.

It is expected that a plane with a carrying capacity of 1500 lb. of mail and 6-hr. cruising radius will not exceed 100 ft. in the wing span. If placed in the wing, engines must be safely accessible to mechanics for minor repairs in the air, and each engine must be equipped with independent and, as far as possible, dual gas, oil and ignition systems.

Bids will be opened on June 2, and it is expected that planes will be ready for delivery within 6 months after letting the contracts.

Bidders are to agree to furnish the planes in lots of six as often as requested at the price specified originally up to June 30, 1920, and must also submit price lists of spare parts and satisfactory bonds with the bid. The time of delivery will count as an important factor in making the contract awards. Following are the general requirements and complete specifications as provided by the Post Office Department:

GENERAL REQUIREMENTS

1. *Fundamental Requirements.* Should be a radical departure from military designing, making the following qualities of primary importance:
   a. Inherent stability in power and glides.
   b. Machine to be balanced for cruising speed, altitude 6000 ft.
   c. Controllability and wide vision.
2. *Performance* (Normal Load).
   a. Efficient cruising speed of 90-100 m.p.h. at 6000 ft.
   b. Cruising radius of 5 to 6 hours.
   c. Buoyancy speed of 50 m.p.h. *or less.*
   d. Low landing speed either inherent or mechanical.
   e. Ceiling of about 15,000 ft.
   f. Capable of horizontal flight or climb on one-half normal maximum power.
3. *General Requirements.*
   a. Two or more motors.
   b. Mail load of 1500-3000 lb. at 17½ lb. per cu. ft.
   c. Crew of one pilot and one mechanic on two-motored planes, and two pilots and one mechanic on three-motored planes.
   d. A method of retracting or hinging wings for storage with wing spans over 80 ft. Optional.
   e. Overall height of 18 ft.
   f. To be capable of easy assembly and disassembly.

DETAILED CONSTRUCTION

1. *Power Plants.*
   a. To be independent power plants.
   b. Accessible for major repairs or removal.
   c. Accessibility for minor repairs during flight.
   d. An approved motor starter system.
   e. Complete radiator shutters adjustable from pilot's seat.
   f. A compression release to be provided for each motor.
2. *Fuselage.*
   a. Preferably a removable mail cage which may be drawn up into fuselage recess.
   b. Steerable tail skid to be optional with builder.
   c. Two tail skids to be provided in tandem; that is, one behind the other, with universal joints, if practicable.
   d. In flight, fuselage to withstand a loading of 30 lb. per sq. ft. on horizontal tail surfaces and 20 lb. per sq. ft. on vertical tail surfaces.
   e. Fuselage to have landing factor of safety of 12-15.
   f. Accessibility of all tanks, leads, controls, etc., during flight.
   g. Variable loads at center of gravity.
3. *Wings.*
   a. Approved construction.
   b. Factor of safety of 6.
   c. Extra strength wing skids hinged with shock absorber of rubber.
4. *Landing Gear.*
   a. To have a factor of safety of 15 in all members.
   b. Center of gravity to be as far back of landing gear as possible.
   c. Elimination of any tendency to nose over.
   d. Landing gear to give adequate support to motors.
5. *Controls and Control Surfaces.*
   a. "Dep."
   b. All controls to be readily accessible for maintenance and repair.
   c. All control surfaces to be balanced where necessary for easy handling.
   d. Emergency control to be provided with removable stick.
   e. Variable horizontal stabilizer to be provided and balanced at neutral point with standard load.
   f. Internal controls designed to be free from danger of ice.
6. *Gas and Oil.*
   a. An independent gas and oil supply for each motor, with intercommunication leads.
   b. An absolutely reliable gas feed system such as provided by mechanical vane pumps and central hand pump as auxiliary.
   c. Accessibility to all valves and leads, both oil and gas, for repairs while in flight.
   d. Strongly anchored tanks.
   e. All leads to be protected against vibration.
7. *Safety and Comfort of Crew.*
   a. Pilot and pilot mechanic to be placed behind main loads, or preferably to

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Protest Prohibition of Imports

Importers of American Cars in France Want Bars Let Down —Would Reduce Tariff

NEW YORK, April 9—French importers of American cars have lodged a complaint with the American Peace Commission regarding the present prohibition of importation into France, and have outlined their position in a letter addressed to C. C. Hanch, who is at present in Europe as the representative of the N. A. C. C.

The complaint comes from the *Groupement des Importateurs d'Automobiles Americaines,* and urges the speedy abandonment of the prohibition law on the plea that competition is needed by those who sell French cars, those who make them and those who buy them. The letter suggests a reduction in customs duties, but would have a comparatively high duty for a time to protect French industry, with a reduction as the industry builds itself up. The letter follows:

In the interest of the importers into France of American automobiles, we desire to bring to your notice the situation which is brought about by the embargo existing in France at the present time, and to expose to you our ideas as to the means of alleviating this situation in the interest of:

1. The American automobile manufacturers.
2. Importers of American cars and their French dealers, and
3. The French public in general.

Before the war the customs duty on American automobiles was frs. 750 per 100 kgs. Now, on June 24, 1916, the tariff was increased to 70 per cent *ad valorem* on the value of the goods, augmented by all charges for the transportation, war and maritime insurance; this in order to protect French industry, as all the factories were occupied on war work. At this rate a car costing, say, frs. 8500 in America would pay about frs. 10,000 duty. On April 1, 1917, the French government passed a law prohibiting, purely and simply, all importations of cars of foreign manufacture.

As long as hostilities continued we submitted to this state of affairs, considering them inevitable and necessary to the successful prosecution of the war. Our most ardent desire was the final triumph of the Allied cause.

During this period we and our numerous agents scattered over the whole of France were obliged to live and to keep our business open in spite of the absolute impossibility of trade. We waited patiently and did our best to induce the manufacturers to do the same, thinking that when once the war was successfully terminated we should be allowed to immediately recommence business and develop the sale of American cars in France.

Now the Minister of Industrial Reconstruction in France declares, in his discourse of Feb. 14, 1919, that everything must be done in order to protect the French automobile industry and to stop the inundation of the markets with American automobiles before the French manufacturers are ready to deliver.

The fallacy of this is evident and made manifest by the fact that the French manufacturers are already advertising that their new models are ready for sale to the public.

The reason for the prohibition can therefore not be attributed to the cause mentioned above, but rather to the fact that

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War Contracts Settlement Plan Outlined by War Department

Claims Board Offices All Over Country for Speedy Adjustment—Provision for Raw Material, Work in Process, Interest and Profit

WASHINGTON, April 7—In order to further explain the War Department's method for adjusting and paying contracts, Benedict Crowell, Assistant Secretary of War, has again outlined the system adopted by the War Department. His explanation was made in response to a request by the Treasury Department.

The War Department is ready to terminate any claim if the contractor has agreed to terminate production to the extent requested by the War Department, and will waive all claims to prospective profits on uncompleted portions of the contract. Raw materials, component parts and work in process will be considered in adjustments to an amount not exceeding the uncompleted portion of the contract. Interest will be allowed at 6 per cent on borrowed money, and profit will be allowed up to 10 per cent on work in process. Cost of terminating unperformed sub-contracts will be allowed. The contractors are requested to present statements of claims promptly to their proper claim boards. Following is the complete statement:

ADJUSTMENT AND PAYMENT OF WAR DEPARTMENT CONTRACTS

The following questions have been asked by the Treasury Department:

First: What compensation may contractors safely expect to receive on the termination of war contracts, and

Second: How may that compensation be secured?

Shortly after the signing of the armistice thousands of contractors were asked to reduce or suspend production under war contracts and to negotiate the terms of their final settlement.

Many of these contracts were formal written agreements, but others had not been drawn or signed in the exact manner prescribed by law. While payments were made for finished articles or supplies delivered under both formal and informal agreements, it was impossible, in the absence of remedial legislation, to recognize any obligation to contractors on account of anything done in connection with any part of an informal agreement which had not been fully performed. The remedial legislation was introduced in Congress on Dec. 7, 1918, and became a law on March 2, 1919.

As a result of this legislation, the War Department is now able to adjust and settle all of its war obligations, both formal and informal, and is prepared to do so with the greatest possible speed. The Department desires to make these settlements by voluntary agreement wherever possible, and to avoid litigation.

The Department is ready to adjust every agreement on the basis set out in paragraph 7 hereof. If the contractor agrees to that basis he can secure payments with little or no delay because the Department is prepared to make partial payments in the manner set out in paragraphs 8 and 9 hereof, in those cases where a final adjustment of every item would involve considerable delay.

The Department is prepared to carry on negotiations with great speed, and has stationed in the leading cities of the United States, negotiating officers, agencies or boards, so that each contractor can adjust his own contract near his own place of business. A list of these boards is attached hereto. No final adjustment of War Department obligations can be secured, however, unless the contractors will co-operate with the Department.

The process and basis of effecting a settlement is as follows:

1. Every contractor should present a statement or claim which should set out the amount of his expenditures and obligations, the amount and character of materials, supplies and property which he has, the amount which he believes the United States should pay if it takes title to all this material and property in its present condition, and the amount which the contractor believes the United States should pay if the contractor retains this material and property.

2. If any sub-contracts or other items or elements are involved with reference to which the contractor cannot, at the present time, state any final and definite figure, he should at least give such information in connection therewith as is presently available.

3. Where the original contract is a formal one, executed in the manner prescribed by law, this statement or claim should be presented in such place and form as the Supply Bureau which made the contract shall designate. Information as to form and place of filing can be secured from any contracting officer, board or agency within that Bureau.

4. If the original agreement is an informal one and an adjustment thereof is to be made under the Act of Congress of March 2, 1919, the contractor should file with the Claims Board of the Bureau with which the agreement was made, a formal claim, setting out the nature, terms and conditions of the agreement and the amount of money claimed. Proper addresses of these Claims Boards are as follows:

Ordnance Claims Board, War Department, Washington.

Claims Board, Air Service, War Department, Washington.

Claims Board, Chemical Warfare Service, War Department, Washington.

Claims Board, Construction Division, War Department, Washington.

Claims Board, Director of Purchase, War Department, Washington.

Claims Board, Signal Corps, War Department, Washington.

Claims Board, Office Chief of Engineers, War Department, Washington.

(Claims based on agreements with the Quartermaster Corps should be addressed to the Claims Board, Director of Purchase, as above.)

5. Forms for stating claims on informal agreements can be secured from any contracting officer, supply officer, Claims Board or negotiating body of any Bureau at any part of the United States, and these officers, Boards or bodies will give the contractors information and instruction concerning the manner of filling out these claims.

6. After the contractor's claim is presented, the facts therein stated are investigated and verified and negotiations are carried on to fix the terms of final settlement. When these negotiations are completed, the final settlement is made by a supplemental agreement based upon the original contract, if that contract is a formal one executed in the manner prescribed by law, or by an award under the Act of Congress of March 2, 1919, if the original agreement is within the terms of that Act.

In case any contractor is in doubt as to whether or not his agreement does or does not come under the terms of the Act, he can get immediate information by inquiring from the appropriate Procurement Bureau in Washington, or from any of its agencies throughout the United States.

7. If the contractor has agreed to terminate production to the extent requested by the War Department, and will waive all claims to prospective profits which he might have made had the uncompleted portion of his contract been performed, he will be paid:

(a) For raw materials, component parts and work in process on hand in an amount not to exceed the requirements of the uncompleted portion of the contract, the cost thereof plus inward handling charges, plus overhead directly applicable. If this full payment is made, title and possession of the materials, parts and work in process shall be transferred to the United States. If by agreement the contractor retains title to any of this material, parts or work in process, the agreed value thereof shall be deducted from the amount otherwise payable.

(b) A remuneration or reward ordinarily fixed at

(1) Interest at the rate of 6 per cent per annum on money invested in raw materials and component parts, or if the money was borrowed, then interest actually paid, and

(2) 10 per cent profit on work in process.

(c) An amount equal to all money which the contractor is compelled to expend to terminate and discharge unperformed subcontracts or commitments properly made for the purpose of performing the uncompleted portion of the contract.

(d) Such amounts as are necessarily spent in connection with the care and custody of property involved from the date that the contractor has suspended production down to the time of settlement.

(e) On account of facilities, machinery and equipment acquired for the purpose of performing the contract, and the cost of which would have been recouped had the contract been performed,—an amount which shall be computed as follows: From the cost deduct the present value, and of the balance take the same proportion that the uncompleted part of the contract bears to the whole.

(f) Any other special item of expenditure which, in the opinion of the Secretary of War or any duly authorized officer, is proper.

For the purpose of determining the exact amount payable under paragraphs (a) and (b) above, raw materials and component parts have been defined, for the purpose of contract termination, as follows:

"All of those materials, parts, articles and supplies, direct and indirect, which are in substantially the same condition, nature or state of fabrication that they were in when they were acquired by the contractor, and in the production, fabrication or assembling of which the contractor has neither employed nor performed labor other than labor connected with custody and handling."

(8) It frequently happens that the determination of all of the amounts which may be payable in accordance with the terms of the foregoing paragraphs, and the determination of the most economic disposition which can be made of all property involved in final settlement, requires a considerable time, but that there are many items with respect to which a final adjustment can readily be made. It further happens that it is often of economic value to make an immediate adjustment and, payment of some of the items involved without waiting for an adjustment and payment of all. Under such circumstances, if the contract is a formal one, a supplemental agreement will be entered into which will fix the basis of final adjustment as outlined in paragraph 7, and will provide for the payment of each item involved just as rapidly as the amount payable is determined. In this way, various raw materials, supplies and work in process can be put to an immediate use, and the contractor's plant kept in production, and labor retained in employment and the contractor's obligations on different sub-contracts and commitments finally disposed of just as rapidly as tentative agreements are reached with the sub-contractors and commitment men.

9. When the agreement is an informal one and is paid by award under the Act of Congress of March 2, 1919, if it is found that a situation exists similar to that described in paragraph 8, partial awards are made, and items are adjusted and discharged just as rapidly as the amounts to be paid are determined.

10. The attention of all contractors should be directed to the fact that where their agreements are informal, their claims must be filed prior to June 30, 1919; otherwise they are, by the Act of Congress of March 2, 1919, forever barred from any relief.

11. There is no occasion for any contractor to have any doubt about his ability to secure an adjustment on the basis above outlined. Although several months have passed since the contractors were requested temporarily to suspend production, there are thousands of contractors who have as yet presented no statement or claim showing what they want. If there are any reasons why any contractor cannot state his full claim and the disposition which he desires to have made with reference to every item thereof, there is no reason why he should not present as much of his claim as possible in order that the necessary investigations and negotiations can be proceeding. The organization which is handling this matter is essentially civilian in character, and composed of men who have come into the Department merely for the purposes of the war and who remain in this work only at a very great personal sacrifice and at the urgent request of the department. Contractors who desire to avail themselves of the existing organization in the department for the settlement of their claims must present them prior to May 15, 1919, as after that date the method of handling these claims will necessarily be changed through the impossibility of continuing the present personnel.

12. For the purpose of supervising and securing uniformity in regard to settlement of formal contracts, and for the purpose of making awards under the Act of Congress of March 2, 1919, the War Department Claims Board has been created, and this board, or its

members, are in constant duty in Washington. From time to time this board issues detailed instructions and directions governing the methods of making settlements. These are available to any contractor at any time. Actual negotiations under these instructions and rules are, however, carried on with the contractor by the various agencies scattered throughout the country.

BENEDICT CROWELL,
The Assistant Secretary of War, Director of Munitions.

LIST OF BOARDS SUPERVISING AND PASSING UPON THE ADJUSTMENT OF CONTRACTS IN THE WAR DEPARTMENT.

War Department Claims Board, Washington, Munitions Building.
Board of Contract Adjustment, Munitions Building, Washington.
Ordnance Claims Board, War Department, Washington.
Claims Board, Air Service, War Department, Washington.
Claims Board, Chemical Warfare Service, War Department, Washington.
Claims Board, Construction Division, War Department, Washington.
Claims Board, Signal Corps, War Department, Washington.
Claims Board, Office Chief of Engineers, War Department, Washington.
Claims Board, Director of Purchase, War Department, Washington.
Board of Review for Medical & Hospital Supplies Division, War Department, Washington.
Board of Review for Machinery & Engineering Materials Division, War Department, Washington.
Board of Review for Motors & Vehicles Division, War Department, Washington.

DISTRICT AND ZONE BOARDS

Ordnance District Claims Boards

Baltimore; Bridgeport, 945 Main Street; Boston, 19 Portland Street; Chicago, 155 E. Superior Street; Cincinnati, 229 E. Sixth Street; Cleveland, Plymouth Bldg., Cleveland; Detroit, 35 Washington Blvd., Detroit; New York, 1107 Broadway; Philadelphia, 1710 Market Street; Pittsburgh, Chamber of Commerce Bldg., Pittsburgh; Rochester, 82 St. Paul Street; St. Louis, Equitable Bldg.

Chemical Warfare Service

Board of Review, Gas Defense, New York City.
Board of Review, Gas Defense, Edgewood Arsenal.
Board of Review, Gas Development, Cleveland.

Zone Boards of Contract Review, Office of the Director of Purchase and Storage

Zone No. 1, Boston, 108 Massachusetts Avenue.
Zone No. 2, New York City, 461 Eighth Avenue.
Zone No. 3, Phi'adelphia, Twenty-first and Oregon Avenue.
Zone No. 4, Baltimore, Coca-Cola Building.
Zone No. 5, Atlanta, Transportation Building.
Zone No. 6, Jeffersonville, Ind., Meigs Avenue.
Zone No. 7, Chicago, 1819 W. 39th Street.
Zone No. 8, St. Louis, Mo., Second and Arsenal streets.
Zone No. 9, New Orleans, Audubon building.
Zone No. 10, San Antonio, General Supply Depot.
Zone No. 11, Omaha, Army Building.
Zone No. 12, El Paso.
Zone No. 13, San Francisco, Fort Mason.
Zone No. 14, Washington, 17th and F streets, N. W.

The District Offices of Air Service Finance

Lt. L. S. Landers, Dist. Finance Manager, Boston, Little building, Boylston and Tremont streets.
Capt. A. B. Berger, Dist. Finance Manager, New York, 360 Madison avenue, Abercrombie & Fitch building, ninth floor.
J. E. Cole, Dist. Finance Manager, Buffalo, P. O. Box 56.
Capt. Fred White, Dist. Finance Manager, Detroit, 1550 Woodward avenue.
C. S. Hamilton, Dist. Finance Manager, Chicago, Room 1216 Consumers building.
Lt. N. L. MacLeod, Dist. Finance Manager, Pittsburgh, Seventh and Liberty avenues, eleventh floor Kennan building.
Capt. D. G. Ong, Dist. Finance Manager, Dayton, 810 Mutual Home building.
C. C. Campbell, Dist. Finance Manager, Portland, Ore., Yeon building.

56,000,000 Acres Added for Tractor Possibilities

WASHINGTON, April 5—The possibilities of a steadily increasing farm tractor business are indicated in the announcement made to-day by the Department of Agriculture that more than 56,000,000 acres have been added to the country's aggregate crop acreage in the last 10 years. The figures given out show that the aggregate last year totaled 367,738,000 acres, or 605,840 square miles. This covers more than one-fifth of the land area of the United States. The number of farms is estimated at 6,717,000.

Texas has the largest aggregate crop acreage, with 25,328,000 acres, or a little more than one-sixth of her total land area. Kansas is second, with 22,588,000 acres, or almost half of her entire land area. Illinois is third, with 21,727,000 acres, or about three-sevenths of her land area. Iowa, in fourth place, is very close to Illinois, with 21,613,000 acres, which is about three-sevenths of her land area.

The aggregate crop acreages, which included those of corn, wheat, barley, oats, rye, buckwheat, potatoes, sweet potatoes, tobacco, flax, rice, hay, cotton, peanuts, kafirs, beans, broom corn, hops and cranberries, and the number of farms by States follow:

56,000,000 FARM ACRES INCREASE

State	1918	Farms
Maine	1,633,000	60,000
New Hampshire	592,000	27,000
Vermont	1,307,000	33,000
Massachusetts	674,000	37,000
Rhode Island	88,000	5,000
Connecticut	601,000	227,000
New York	8,509,000	215,000
New Jersey	1,183 000	33,000
Pennsylvania	8,377.000	218,000
Delaware	526,000	11,000
Maryland	2,254,000	50,000
Virginia	5,577,000	195,000
West Virginia	2,351,000	100,000
North Carolina	7,232 000	275,000
South Carolina	6,992,000	190,000
Georgia	12,624,000	330,000
Florida	1,563,000	56,000
Ohio	11,462,000	270,000
Indiana	12,764,000	215,000
Illinois	21 727,000	245,000
Michigan	8,808,000	209,000
Wisconsin	9,326,000	182,000
Minnesota	16,008,000	157,000
Iowa	21,613,000	215,000
Missouri	15.232,000	275,000
North Dakota	18.298 000	95,000
South Dakota	15,845,000	95,000
Nebraska	18,646,000	135,000
Kansas	22.588,000	180,000
Kentucky	6,922,000	270,000
Tennessee	7,252,000	260,000
Alabama	10 569,000	280,000
Mississippi	8,089,000	295,000
Louisiana	4,981,000	123,000
Texas	25,328,000	450,000
Oklahoma	13,744,000	220,000
Arkansas	7,399,000	230,000
Montana	4,845 000	36,000
Wyoming	1,569,000	15,000
Colorado	4,060,000	60,000
New Mexico	1,485,000	45,000
Arizona	477,000	13,000
Utah	1,095,000	24,000
Nevada	448,000	3,000
Idaho	2,136,000	38,000
Washington	3,649,000	70,000
Oregon	2,768,000	52,000
California	5,927,000	98,000
United States	367,738,000	6,717,000

Farm lands in the United States are steadily increasing in value. The Department of Agriculture reports the average grade of plow lands was worth about $74.31 per acre on March 1 this year, compared with $68.38 a year ago, $62.17 two years ago and $58.39 three years ago.

Values show the greatest percentage increase during the last year occurred in the South Atlantic States, in the Carolinas and Georgia, and extended to Alabama, Kentucky and Arkansas. Small or no increases were made in the New England States, the Pacific Coast States and Louisiana, Texas, Kansas and Montana. Material increases were reported from Nebraska and South Dakota.

Iowa's plowing lands stand first in value, her average being $169 per acre, followed by Illinois with $144, California with $121, and Indiana with $100. Alabama reports the lowest average of plow lands at $24 per acre, and Mississippi next at $25.50.

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Canada Takes Most American Tractor Engine Exports

WASHINGTON, April 5—Canada was the largest user of American farm tractor engines in the month of January. A total of 2711 engines, valued at $2,799,852, were exported from the United States into Canada. France was the next largest user, taking 584 engines, and Italy was third with 242. Following are the statistics:

Countries	Number	Value
France	584	$826,207
Greece	105	63,700
Italy	242	448,635
Norway	1	2,208
Portugal	22	7,032
England	29	39,408
Canada	2,711	2,799,852
Guatemala	1	1,525
Mexico	27	31,868
Jamaica	1	1,890
Cuba	30	20,393
French West Indies	2	3,750
Argentina	2	3,800
Brazil	2	2,383
Chile	15	24,750
British Guiana	11	12,904
Peru	6	18,138
Venezuela	3	2,400
China	2	2,378
Australia	3	1,861
New Zealand	36	27,126
Philippine Islands	33	45,756
British South Africa	28	22,016
French Africa	1	325
Total	3,897	$4,410 305

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Interstate Highways Approve Federal System

KANSAS CITY, April 7—Twenty-eight interstate highway associations have so far qualified for membership in the Associated Highways of America. They represent about 50,000 miles of marked highways, reaching to nearly every part of the United States, to the borders of Canada and Mexico and to the coasts. By the time Congress convenes the organization will be further strengthened, and it will back a bill for a Federal Highway Commission, probably one of the bills already introduced. The Associated Highways of America will present the combined system of marked highways of its membership as the plan for Congress to adopt, for the Federal system to be built and maintained by the Government.

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Northern Foundry Doubles Force

MARINETTE, WIS., April 7—The Northern Foundry Co. will double its operating force at once.

Pulcher Heads N. A. C. C. Truck Show Committee

NEW YORK, April 9—Martin L. Pulcher, vice-president of the Federal Motor Truck Co., has been appointed chairman of a motor truck show committee of the National Automobile Chamber of Commerce to arrange for proposed exhibits of trucks in New York and Chicago next winter during the same weeks as the national passenger car shows. Associated with him on the committee are A. J. Wipple, general sales manager of the Diamond-T Motor Car Co., Chicago; David S. Ludlum, president of the Autocar Co., Ardmore. Several additional members of the Motor Truck Committee have been appointed as follows: David C. Fenner, Mack Bros. Motor Car Co., and R. H. Salmons, Selden Motor Vehicle Co. F. W. Fenn, who has handled the Rural Motor Express Department of the N. A. C. C., has been made secretary of the Motor Truck Committee.

D. C. Fenner has been appointed chairman of the committee to co-operate with the S. A. E. in furthering truck standardization work, and associated with him are Francis Davis (Pierce-Arrow), F. A. Whitten (General Motors), E. M. Sternberg (Sterling), F. F. Beall (Packard). Another committee has been appointed to revise the standard service and repair parts policies of the N. A. C. C. as they relate to trucks. Members of the committee are: Chairman, E. T. Herbig (Service), F. H. Drew (Packard), W. M. Ladd (Pierce-Arrow), A. B. Cumner (Autocar), F. H. Harris (Republic).

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Unsettled Steel Price

(*Continued from page* 816)

There is a general attitude of doubt displayed by the purchasing agents. The trade is demanding lower prices, the manufacturers of cars and trucks are demanding lower prices. The parts makers are demanding lower material prices, and this is the situation right at present. In normal times the steel mills should be running 100 per cent capacity at this time of the year. The companies should have the major portion of their 1919 steel purchased or contracted for. The companies, however, have but little steel on hand and are buying in small lots. The mills, purchasing men declare, are only operating at from 50 to 70 per cent capacity.

While some are holding back for an expected drop, others declare this reduction is impossible. But whether the market goes up or down, the automotive industry is going to wait until a more stable condition prevails. It is believed that pronounced buying will send the price up, because of high fuel cost, high labor prices and high overhead which are the big elements which will cause a further upward movement at the mills. High labor and raw material cost prevent such a reduction, they declare.

While the automobile passenger car business has been flourishing from the moment the big plants got back to peace production, the truck industry has been decidedly backward. Makers of axles and other parts declare they are prepared to do twice the truck business they are doing at present.

The truck makers, however, tell of good buying business and fair production schedules, but the parts makers hold that the truck business is not what it could be. Competition in the truck field is decidedly keen and new truck companies are springing up with regularity both in Detroit and other parts of the state. This competition is shaping itself into a matter of efficiency and price. The best truck at the best price is going to get the business, and knowing this the truck makers are endeavoring to shave prices as low as possible conducive to reasonable profit.

This policy has caused curtailed production, inasmuch as the makers hoped steel price reduction would aid them in decreasing manufacturing costs and permit the establishment of lower retail truck prices. There is no question but what steel price fixing has given this department of the automotive industry greater confidence than the others.

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Protest Prohibition of Imports

(*Continued from page* 817)

the manufacturers fear and exaggerate the danger of American competition. We know ourselves that competition never had any baneful or injurious effects for the consumer or the producer. We possess proof of this in America, where competition is extremely acute, especially in the automobile industry, and it is an incontestable fact that most automobile manufacturers in the United States are in a prosperous and flourishing condition. It is only necessary to glance at the retail price of automobiles in America to appreciate the advantage which the general public derives from this competition.

As long as the importation of American automobiles is prohibited in France the French manufacturers will have every opportunity to sell at excessively high prices and therefore make large profits, to the detriment of the French public.

We do not ask to immediately return to the pre-war customs tariffs, as we understand perfectly that it is necessary to protect the French automobile industry; but we do not admit that it should be protected in such a manner as to be prejudicial to the interests of the French public and the good will and friendship which exists between the two sister republics. We only desire to be allowed to compete in a fair and loyal manner with the French constructors.

We would ask you, therefore, to assist us in every way possible to obtain, without further delay, the cancellation of the prohibition order at present existing, and that we be advised immediately as to the date of its ultimate suppression.

In order to facilitate the abolition of this order we would be disposed to accept the imposition of customs duties which would commence at a certain rate and gradually decrease each quarter until a normal rate is attained. These duties will be calculated upon the purchase price in the United States, in the same manner as French goods exported to America, which are only taxed upon the invoice value in France.

The customs tariffs between the United States and France should be established on a reciprocal basis. The tariff in force at the present time, which is imposed on the actual cost of the goods delivered at a French port, places the English, Swiss and Italian manufacturers in a far more advantageous position than the American, as the first named have very little freight to disburse, whereas the cost of transportation from the United States is, and probably will be for some considerable time, extremely enormous.

With a scale of customs duties based upon the proposition indicated in this letter, French industry would be protected in an efficacious manner without undue hinderance to our numerous dealers throughout France and would at least permit them to earn their livelihood and contribute to the support of the workmen they employ.

In like manner this would conduce to maintain the good will and friendship which should endure between France and the United States after the substantial assistance rendered by America toward the successful prosecution of the war.

It is certainly in the interests of the French public that the importation of American automobiles into France should be permitted without undue let or hindrance, otherwise the French manufacturers will continue to maintain the present exorbitant prices.

It might be argued that the French constructors do not in any way acquire large profits, but we feel assured that if importation from America is authorized they would immediately reduce their prices to a considerable extent and they would so adapt their methods of fabrication to those practised in America that they would prosper in spite of foreign rivalry. As mentioned previously, competition is salutary and, in our opinion, necessary.

The fact must not be lost sight of that the American factories have been more or less exclusively employed during the past year or so upon work in connection with the war, and in view of this they are practically in the same situation as the French factories. In this way they do not constitute a very formidable menace to French industry, as they will be obliged to limit the exportation of their products in order to cope with the demands of the American public. Another fact which might be noted is that the cost of raw material has increased considerably in the United States, so that it will be a practical impossibility to revert to pre-war prices.

New Officials of S. A. E. Metropolitan Section

NEW YORK, April 10—At the monthly meeting of the Metropolitan Section of the Society of Automotive Engineers held last night at the Automobile Club of America, officers for the ensuing year were announced as follows: Chairman, A. C. Bergmann; treasurer, Lars G. Nielson; secretary, Austin M. Wolf. H. M. Crane, F. G. Diffin and Alfred Reeves form the board of governors.

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Postoffice Wants 10 Planes

(*Continued from page* 817)

be placed over loads in streamline at at top of fuselage.

b. That provisions be made for protection against bad weather.

c. A passage way to be provided, so that vital parts are accessible to mechanic in flight.

d. That suitable slideways and eyes be provided for belt and snap hook to be worn by mechanic in making repairs in exposed places.

e. Suggested that streamlining on exposed power plants be hinged at front and of sufficient width and length to provide shelter for mechanic while working on motor. To be held out by suitable, adjustable strut.

f. That room be available in control cockpit for map boards, instruments and radio controls.

g. That a good fire extinguisher system be provided, such as Pyrene or equal, tubed by suitable leads to gasoline tanks and all motor compartments, to be operated from control cockpit.

h. That pilot's seat be adjustable in relation to controls.

Bidders are requested to submit with proposals full information and particulars, as indicated below, of the ships that they propose to furnish.

a. *General Arrangement Drawings*, showing plan, side and front elevations, drawn to a scale of one-twelfth or one twenty-fourth full size.

b. *Main Dimensions.* Areas of maian surfaces, areas of control surfaces, stagger, dihedral, incidence, span, chord, gap, gap-chord ratio, setting of stabilizer to wing chord.

c. *Weight Schedule and Balance Diagram*, giving weight of power plant and accessories, fuel and oil, mail load, passenger and pilot and instrument loads, structural weight subdivided into groups. Balance diagram for ship with normal load, showing position of center of gravity.

d. *Performance Estimates.* Speed, climb, speed at altitude, endurance at full power ground level, endurance at 6000 ft. at cruising speed.

e. *Power Plant.* Fuel and oil consumption and brake-horsepower curve for engine other than Liberty motor. Diagrams and descriptions of gasoline system, cooling system, oil-circulation systems.

f. *Stress Diagrams* for Wing Truss, Fuselage with air and ground loads, Landing Gear.

g. *General Assemblies of and Structural Information* on wing structure, fuselage and landing gear, with details of special construction, important fittings, statements as to whether streamline wire or cable will be employed, etc.

Materials and Shop Processes. All materials and shop processes employed should be in accordance with either Army or Navy specifications and standards.

Inspection. Airplanes in process of construction shall be open to the inspection of the Post Office Department.

Tests Prior to Acceptance. One machine to be sand-tested at the option of the Post Office Department, in accordance with the Army Specifications. One machine to be tested for performance, landing speed and controllability—tests to be carried out by the Post Office Department.

Unless otherwise provided, remaining airplanes under the contract will be accepted, based upon inspection complete at the works and on inspection of complete drawings. This is for the purpose of checking parts, alignment, completeness and satisfaction of details. At this time the power plant shall be operated in every detail to the satisfaction of the Post Office Department.

General Motors Plans to Spend $37,398,000

For Additions, Plants and Equipment in Flint, Detroit, Pontiac, Toledo, Etc.

DETROIT, April 3—General Motors Corp. expansion plans for 1919 were outlined to-day by William C. Durant, its president and general manager. Combined, they entail an expenditure of $37,398,000 to be invested in new plants, additions, office and sales buildings and new equipment in Detroit, Flint, Pontiac, Lansing, Saginaw, Toledo, St. Louis, Mo., Janesville, Wis., Bristol, Conn., and Muncie, Ind.

Detroit will get the lion's share of the appropriation, $12,650,000 to be spent here. General Motors expansion here includes a complete new plant for the Cadillac Motor Car Co. division, to be located on Clark and Scotten avenues; a sales and service building for the same company to be at the corner of York and Cass avenues; a $5,000,000 15-story general office building for the General Motors Corp. and all of its subsidiary units, to be located on Cass Avenue, with a four-story research laboratory in the rear; a differential gear and transmission plant; a general bearing and power plant; extensions to the Central Forge Co., and the Northway Motor & Manufacturing Co. plant, all to be located on Holbrook Avenue.

The proposed office building will cover an area of 336 x 482 ft. Four wings will extend from front to rear, and these will be connected by a central wing, this plan offering direct outside light to every office in the building. The ground floor will contain salesrooms for all of the subsidiary companies of the corporation, as well as service stations for the United Motors Corp.

In the center of the building and on the ground floor there will be an auditorium seating approximately 1000, with stage, dressing rooms, etc. It will be used for conventions and other purposes. The main entrance will be in the center. Other entrances will lead from both sides to the main lobby and elevators. There will be 16 passenger elevators in the building. The laboratory in the rear will be 60 x 480. It will be 4 stories high, with approximately 50,000 sq. ft. of office space on each floor. The entire building, including laboratory, will have a floor area of about 875,000 sq. ft., exclusive of corridors, toilets, elevators. It will be strictly fireproof.

Buick and Chevrolet Extension

General Motors will spend $6,715,000 at Flint, where large plant extensions to the Buick and Chevrolet companies are proposed. The remainder of the appropriation will be used to build 1000 homes for employees, with water mains, sewer systems, paved streets, etc. They will be sold to the workers on easy payment plan.

Lansing projects total $2,540,000. A new axle plant will be built and large extensions made to the Olds Motor Works division. At Saginaw, $2,427,000 will be spent in extensions to the central foundry, motor and steering gear departments for the Saginaw Products division and a central heating plant. Toledo will get $543,000 to be invested in extending the transmission department of the Chevrolet Motor Co. branch factory there. A new plant will be built for the St. Louis Woodworking Co. at St. Louis, Mo., as well as large assembling plants for the Buick and Chevrolet division in that city. These improvements will cost $4,135,000.

Janesville, Wis., projects total $4,500,000 and include plant extensions for the Janesville Machine Co., the Sampson Tractor Co. and hundreds of houses for employees. At Bristol, Conn., $1,028,000 will be spent in extending the present plant of the New Departure Manufacturing Co. At Muncie, Ind., $800,000 will be spent in plant extensions and houses for employees.

Mr. Durant also said that Walter P. Chrysler, now president and general manager of the Buick Motor Car Co., Flint, has been made vice-president in charge of all General Motors operations and assistant to Mr. Durant. This new arrangement does not involve any material changes in the policy of the independent management of the General Motors division. The central operating organization headed by Mr. Chrysler will direct the carrying out of the policies of the corporation.

Mr. Chrysler will be succeeded by Harry H. Bassett, as general manager of the Buick. He has been associated with Mr. Chrysler as assistant general manager for several years.

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Minerva to Supply Truck and Tractor Engines

CLEVELAND, April 6—The Minerva Engine Co., which has been incorporated here under Ohio state laws for $250,000, will engage in the manufacture of truck and tractor engines. The officers and directors are: President, C. S. Goby; vice-president, R. K. Johnson; secretary, L. R. Long. The directors include E. P. Dowling, John R. Dowling, H. F. Eilbert and J. J. Cummings. Offices have been established in the Vickers building.

Experiments and tests are completed and preparations are under way for immediate production. The company expects to give employment to several hundred men. For the present it will make only its Model A engine, which is a 50 hp. machine. It will be manufactured for other lines as well as tractors and trucks.

R. K. Johnson, director of engineering, was formerly connected in a similar capacity with the Garford Engineering Co., and the Gramm Motor Truck Co. He also spent two years in England studying engine design. The engine has a special water-jacket construction, high pressure oiling system and an air cleaning device for purifying the air of dust before it enters the carbureter. A plant will be erected early this spring.

Housing an Important Problem

Cessation of Building in Detroit Creates Serious Shortage of Workers' Homes

DETROIT, April 6—The Detroit Housing Association, of which Frank W. Blair is president, is completing organization of a separate $1,000,000 corporation to build homes for workingmen in Detroit at minimum cost. It is hoped to enlist the aid of every merchant and manufacturer of the city with the view of solving the city's serious housing problem.

Hundreds of Detroiters have walked the streets for months looking for houses and apartments. The present shortage is the result of the cessation of building during the war, in which time 61,999 families have reported to have come to Detroit, while but 28,196 houses were erected. Allan A. Templeton, president of the Chamber of Commerce, declares the plan of building houses on a wholesale scale is the only method which can be pursued in solving the problem.

Detroit companies are vitally interested in finding suitable living conditions for their workingmen. The Ford Motor Co. has solved the housing problem as far as Highland Park is concerned by the inauguration of a realty department and a building and loan association, where Ford employees are encouraged to borrow and build on the easy payment plan. The Ford Co. urges its workmen to build and settle down, and this factor has been successful in cutting turnover.

At Dearborn, Henry Ford is duplicating his Highland Park housing program. His recently incorporated Dearborn Realty & Construction Co. has scores of small homes in the course of construction. This company is contemplating house construction on a gigantic scale. It is expected that the General Motors Corp. will shortly announce a housing project for Detroit similar to that about to be undertaken by the corporation at Flint and Janesville, Wis. The Solvay Process Co., for years past, has been engaged in providing housing for its employees. The Edison Co., American Blower Co., Gemmer Manufacturing Co., Timken-Detroit Co. have also engaged more or less in providing homes.

At Ojibway, Ont., just across the river from Dearborn, the Canadian Steel Corp. is building a second and greater Gary.

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Contract Cancellations Increasing

WASHINGTON, April 9—Cancellations of aircraft war contracts have increased until 84 per cent of those outstanding Nov. 9, 1918, have been terminated, with 15 per cent delivered since that time and 1 per cent remaining in force. Contracts of the motors and vehicles section have been terminated up to 63 per cent of those outstanding Nov. 9, with 24 per cent delivered since that time and 13 per cent remaining for completion.

Lieutenant Andre Boillot, who will fly at the Indianapolis Speedway, May 31. The machine is a French fighting Spad which was used by Boillot at the front

Bleriot-Spad for Indianapolis

PARIS, March 20—André Boillot will fly the latest type of French army fighting plane during the Indianapolis race meeting on May 31. Young Boillot is the only surviving brother of the well-known Georges Boillot, who was killed in a single-handed fight against seven German planes. Immediately after the death of his brother, André Boillot, who was then serving in the infantry, asked to be transferred to the air service. Within a few months he was at the front and won the Croix de Guerre. For the last twelve months Boillot has been chief test and experimental pilot at the Bleriot factory, and has carried out all the initial trials with the latest French scout machines.

The machine with which Boillot will give exhibitions at Indianapolis is a Bleriot-Spad which was used on the front by the French pilot Fonck. This type of machine has never previously been seen in America.

In addition to coming as an air pilot, it is quite possible that André Boillot will start in the Indianapolis race on a 150 cu. in. Peugeot. If he does this his flying exhibitions will be given either before or after the speed contest. The little Peugeot is a machine which was built in 1914 for a race to be held in France in August of that year. The war prevented that race, and the machines were stored away awaiting better days. Officially Peugeot is unable to take part in the Indianapolis race, but Boillot has secured the loan of one of these small racers and is having it equipped.

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Official Indianapolis Entries to Date

NEW YORK, April 7—Ralph De Palma, in his special Packard, equipped with an engine having a piston displacement of 299.2 cu. in., has entered his name for the Indianapolis events on May 31. Louis Chevrolet will also race in a special model which is presumably a Frontenac, although the name has not been disclosed, and has a piston displacement of 299.5 cu. in. Another Frontenac special with a displacement of 299 cu. in. will be driven by Ralph Mulford. Three Duesenberg specials have been entered, one a Roamer-Duesenberg to be driven by Kurt Hitke, the other two by Tom Milton and Ed O'Donel. Earl Cooper will have a Stutz. Besides these, as already reported, W. W. Brown will race in his 24-valve Hudson, R. C. Durant in a Chevrolet, and the two Sunbeams will be piloted by J. Chassagne and Dario Resta, who will take Joseph Christiaens' place.

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French Races for 1920

PARIS, March 22—In all probability there will be a Grand Prix road race in France next year. The Automobile Club of France will celebrate its twenty-fifth anniversary in 1920, and intends to mark this happy event by several big demonstrations, of which a road race will be one. No official announcement has been made, but the feeling of manufacturers in general is in favor of road racing next year. In addition to the national race a big speed contest in the neighborhood of Marseilles will be held independently in 1920.

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Birmingham Fair in 1920

WASHINGTON, April 5—The British Industries Fair for 1920 will be held at Birmingham, England, beginning the last Monday in February and continuing 14 days. Exhibits will include motorcycles, cars, trucks, accessories and aeronautic accessories and engines, etc. Further information can be secured from the Chamber of Commerce of Birmingham.

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Willys Picks Men for Profit Split

TOLEDO, April 3—The committee of ten which is to work out the details of the Willys-Overland Co. 50-50 profit sharing plan, which President John N. Willys recently announced for the Toledo factory, has been appointed. Five members of the committee represent the factory and five the executive departments.

L. M. Ellis is chairman of the committee and A. H. Sarvis secretary. Other members are: H. G. Fitch, sales and service department; Harry Bothart, first assembly department; L. A. Miller, administration building; J. R. Woodruff, polishing and plating department; W. J. Highley, compensation department; Wilfred H. Emery, toolroom; Harry A. Webb, paint shop. The method by which the employees will share in the profits of the company on a 50 per cent basis with the stockholders and the date for the first payments are expected to be announced soon.

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289 Refineries in United States

WASHINGTON, April 7—A total of 289 refineries are producing 1,295,115 bbl. of crude oil per day in the United States, according to announcement made to-day by the Bureau of Mines. Following is the list of the petroleum refineries in the United States, with the daily capacity:

State	No. of Refineries	Capacity Bbl.
Arkansas	1	300
California	37	280,870
Colorado	2	1,500
Illinois	11	46 000
Indiana	2	36,500
Kansas	31	71,350
Kentucky	2	2,600
Louisiana	12	67,925
Maryland	4	15,500
Minnesota	1	300
Missouri	5	16,375
New Jersey	4	100,000
New York	4	34,500
Ohio	10	24,360
Oklahoma	79	233,300
Pennsylvania	48	90,935
Texas	26	212,050
Utah	1	800
West Virginia	5	7,700
Wyoming	5	52 250
Total	289	1,295,115

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F. W. D. Tractors to Have Canadian Branch

CLINTONVILLE, WIS., April 7—The establishment of a F. W. D. motor truck assembling plant and branch works at Kitchener, Can., was determined upon at a special meeting of stockholders of the Four Wheel Drive Auto Co. at the main offices here. The plan involves the organization of a new and distinct corporation, having a capital stock of about $200,000, practically all of which will be owned by the stockholders of the present company. With this in view, the corporate articles of the F. W. D. company were ordered amended so that it may legally acquire and own stock in other corporations. While details of the Canadian plant project have not been definitely fixed, it is the intention to erect a large machine shop at Kitchener for the assembling of F. W. D. trucks from parts made here and shipped into Canada in bulk.

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Willys Starts Profit-Sharing

TOLEDO, April 6—The Willys-Overland Co. has approved two sections of the

50-50 profit-sharing plan under which it proposes to operate. The two sections have been completed by the factory committee of ten to work out the details.

Profits which are to be shared with the employees will be distributed five times annually—in April for January, February and March; in July for April, May and June; in October for July, August and September; in December for October and November.

The other section of the plan outlined defines permanent labor. An employee, to become a profit sharer, must have been six months in continuous service. Absence from work because of illness, injury or on consent of employer, does not affect his continuity of service. Absence, however, without report or satisfactory excuse automatically removes the employee from the continuous service record. Overland men still absent in military service will be considered as in continuous service if they make prompt application for re-employment after their discharge from military service.

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Goodyear Council of Industrial Relations

AKRON, April 8—The Goodyear Tire & Rubber Co. has established a Council of Industrial Relations. This will give representation to all employees over 18 years of age, who are American citizens and who have had six months' continuous service or one year's total service with the factory. The council will meet with the factory manager, and is intended to be a broad and comprehensive democratic form of management. About 20,000 employees will be affected.

The council will be composed of an executive council consisting of five men named by the factory manager, the manager and assistant manager of the labor department, two foremen to be selected by all the factory foremen, and six nonsalaried employees. All questions of industrial relations will be passed upon by this body. Its first duty will be to formulate a plan to establish a legislative body along the lines of the national congress, which will give representation to all employees eligible to vote.

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Carlisle Cord Tire Putting Up Plant

STAMFORD, CONN., April 7—The Carlisle Cord Tire Co. will establish its principal factory here, and has purchased about 10 acres of land, with a frontage of 1000 ft. on Fairfield Avenue and a depth of 400 ft. It is expected to be in operation by Aug. 1.

The main building is to be 250 x 150 ft., cement, steel and glass, of sawtooth construction. The company has had a plant at Andover, Mass., for two years, and intends to continue it in operation, although the main factory and executive offices will be moved here.

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Brazil to Spend $500,000 for Aviation

WASHINGTON, April 5—The sum of $500,000 has been appropriated by Brazil for organization of an aviation service, purchase of airplanes, establishment of aviation schools and the buying of various accessories.

Pierce-Arrow Sales Increase 27%

Production Curtailed by War Orders—Aircraft Program Cut Short

BUFFALO, April 8—Gross sales of the Pierce-Arrow Motor Car Co. increased about 27 per cent during the year ended Dec. 31, 1918, or from $32,565,908 in 1917 to $41,354,439 in 1918; and in this period the company produced 8,635 vehicles, of which 1168 were passenger cars and 7467 were trucks. In 1917 the company produced 7703 vehicles, of which 2532 were cars and 5171 were trucks.

The statement for the year ended Dec. 31 last compares with 1917 as follows:

	1918.	1917.
Net profits after depreciation, etc.	$4,273,171	$4,791,274
Estimated war and excess profits and income taxes	1 200,000	1,161,803
Balance	$3,073,171	$3,629,471
Other income	15,601	11,858
Total income	$3,088,772	$3,641,329
Interest	323,032	42,582
Net profit	$2,765,740	$3,598,747
Preferred dividends	800,000	800,000
Balance	$1,965,740	$2,798,747
Common dividends	1,562,500	625,000
Surplus	$403,240	$2,173,747
Previous surplus	2,415,962	242,215
Total surplus	$2,819,202	$2,415,962

The balance sheet as of Dec. 31 last shows:

Assets—	1918.	1917.
Property account	$4,874,350	$5,431,438
Investment in affiliated selling company	40,000	40,000
Inventories	14,582,749	14,837,786
Notes and accounts receivable	4,012,994	3,665,632
Miscellaneous investments and deposits	87,647	86,463
Cash at bank and on hand	2,338,694	1,192,696
Liberty bonds	275,000	634,991
Deferred charges	67,181	195,904
Total assets	$26,278,617	$26,084,912
Liabilities—		
Preferred stock	$10,000,000	$10,000,000
Common stock	1,250,000	1,250,000
Capital surplus	4,081,411	4,081,411
Bank loans	3,837,500	5,141,533
Accounts payable	2,662,202	1,914,402
Customers' deposits	215,800	119,800
Estimated war and excess profits and income taxes	1,200,000	1,161,802
Common dividend payable Feb. 1, 1919	312,500	.....
Surplus	2,819,203	2,415,962
Total liabilities	$26,278,617	$26,084,912

The report to the stockholders says:

"The energies of your company during 1918 were absorbed mainly in war activities under growing demands from the War Industries Board. Passenger car production was curtailed early in the year and was practically deprived of raw material from about August 1 on. Trucks for war purposes were given precedence over trucks for commercial purposes in an increasing ratio as the year advanced. During the latter part of the year it was impossible to secure material for either commercial trucks or passenger cars.

"Coincident with its increased demands for trucks for war purposes, the government besought us to enter the aircraft field. In August the Aircraft Production Board entered into a contract with your company for the manufacture of a large number of Hispano-Suiza airplane engines, deliveries of finished product to begin in 1919. This aircraft program, contemplating the use of two-thirds of our existing machine facilities, seriously interfered with the use of such facilities for the production of war trucks, and additional producing agencies had, therefore, to be created, details in regard to which are given under a later caption.

"With the signing of the armistice on Nov. 11, this entire program of production for government purposes was cut short. Further preparation for aircraft production came to an abrupt end with the cancellation of the aircraft contract—but, inasmuch as this contract contemplated reimbursement of your company for all outlays and there can be no doubt of the government's intentions in this matter, the auditors have set up no reserves against this investment, which appears among accounts receivable. Likewise were canceled the bulk of the truck orders for the United States government and part of the truck orders for the French government. This situation is reflected in the unfilled orders on hand Jan. 1, 1919, which were 2,341, as against 5,098 on hand Jan. 1, 1918.

On the other hand, the armistice put an end to the embargo on passenger car material and resulted in a prompt and gratifying revival of passenger car business. Following the armistice, factory night work and overtime was eliminated and steps were otherwise taken to bring operation down to a normal basis. We are now operating on a permanent 48-hour week basis.

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Shipping to Central America Permitted

WASHINGTON, April 7—Manufacturers of passenger cars, motor trucks, tractors and accessories can ship freely, without individual export licenses, to Mexico, Cuba, Haiti, San Domingo or to any country in Central America or South America, excluding the colonies of Great Britain and France, according to announcement made to-day by the War Trade Board. Fuel oil and gas oil are still restricted in shipment.

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Fuel Oil Contracts Let to Standard

WASHINGTON, April 5—The Shipping Board awarded contracts for 7,500,000 bbl. of fuel oil to the Standard Oil Co. yesterday. This oil is for the operation of vessels under its jurisdiction. The contracts were all for Atlantic and Gulf ports delivery.

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Claudel Carbureter to Have American Production

NEW YORK, April 8—The Aeronautical Equipment Co. has contracted with the Claudel Co. of France for the American rights to manufacture the Claudel carbureter. The contract calls for a minimum of 20,000 carbureters for the first year, progressing through a minimum of 100,000 carbureters in the sixth year. The company expects to exceed these figures very considerably.

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Foreign Drivers to Arrive Soon

PARIS, FRANCE—(Special Cable)—April 8—Coatalen, engineer of the British Sunbeam Co., and Chassagne, who are to drive Sunbeam cars in the 500-mile Sweepstakes Race on the Indianapolis Speedway, May 31, will sail from Liverpool on April 15. A number of other French drivers will sail from Havre on May 3.

—

Re-sells Obsolete and Unserviceable Planes to Curtiss

WASHINGTON, April 4—The War Department has resold a number of obsolete and worn out airplanes and engines to the Curtiss Aeroplane & Motor Corp. The contract was made following a request for bids from various airplane and engine makers, and Curtiss made the highest bid.

Practically every bit of this property, according to the War Department, is obsolete and worn out. The OX-5 engine is one of the 5-cylinder types of engine developing 90 hp., and was used in elementary training planes. They will have to be entirely rebuilt before they will be of any value. The JN-4 planes, which were also used in early training, can in some instances be overhauled and rebuilt, while the remainder, about 50 per cent, will be salvaged. These JN-4 planes are not the same as the JN-4-H planes now used by the Air Service, which are a much later model. The 1100 Standard planes have been condemned by the Air Service and are said to possess only scrap value.

The War Department will continue the policy of requesting bids from manufacturers of airplanes whenever necessary in order to dispose of certain surplus materials without disrupting the market.

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Business Improving Steadily

DETROIT, April 7—All business here, especially in automotive lines, is showing a marked improvement. The transition to a peace basis is going forward with few serious jolts. Released available labor is being rapidly absorbed and building operations have taken a great boom. Work was started on 335 new buildings and 165 new additions during February. The majority of the building operations represent manufacturing plants and business places. The estimated cost of these new structures total $1,279,065.

Business is approximately 34.13 per cent normal as compared with 30 per cent in February. Business above normal during March was 17.64 per cent against 19.99 per cent in February. About 48.23 per cent is below normal, which is a decrease of 2 per cent when compared with February figures. Improvement totals 62.50 per cent, which is a big increase over the February record of 49.18 per cent. Only 8.75 per cent is on the decline, while 28.75 per cent is stationary.

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Air Service Appropriations Cut 50 Per Cent

WASHINGTON, April 7—Appropriations for the Air Service have been reduced 51 per cent for 1918-19 from $944,304,758 to $459,304,758. The total appropriations for the service during the war, after making the reductions, total $1,097,304,758, of which 65 per cent, or $712,000,000, were expended to March 15.

It is estimated that $340,000,000 will be saved in the liquidation of suspended contracts. The following is a summary of the values of cancellations and suspensions of contracts to March 22, 1919:

	Value	Per Cent of Total
Engines and spare parts	$266,961,771	54
Airplanes and spare parts	165,288,590	33
Chemicals and chemical plants	18,648,239	4
Instruments and accessories	10,761,081	2
Balloons and supplies	10,071,035	2
Fabrics, lumber and metals	7,977,445	2
Miscellaneous	13,634,218	3
Total	$493,342,379	

Speculation is Rife in Detroit

Wills and Leland Cars Talked Of —Maxwell-Chalmers and Saxon Affairs

DETROIT, April 4—Automobile business circles are awaiting with keen anticipation the outcome of a number of important matters this week, interest centering in General Motors, Saxon Corp. and Maxwell-Chalmers affairs. The trade is also discussing some pretty authentic rumors of a new car to be brought out soon by C. Harold Wills, formerly with the Ford Motor Co., and one of the designers of the Ford car. The labor situation and the veiled plans of the Lincoln Motor Car Co. are also causing much speculation.

The announcement of W. C. Durant relative to the $37,396,000 General Motors expansion plan, calling for the investment of $12,650,000 in new buildings, plants, additions, etc., in Detroit alone, created somewhat of a sensation, and has served to divert the attention of the automobile business from the tangled affairs of the Saxon Motor Corp. to some extent.

Detroit knows but little about the proposed Maxwell-Chalmers merger, which is said to be steered by the General Motors Corp., and which, if it materializes, will practically give General Motors control of the two companies. It is said General Motors will refinance the combination, taking over all of the common stock of the companies. William C. Durant and other General Motors heads have nothing to say regarding the plan at this time, and no information is being given out at Maxwell-Chalmers headquarters.

It is said, however, that Walter Flanders, president of the Maxwell Co., which is operating the Chalmers properties under a 5 year contract, is soon to resign from the company. It is added that he is disposing of all his Detroit properties and proposes to locate in Chicago. Mr. Flanders himself will not discuss the matter.

Those close to C. Harold Wills declare he is working on a new passenger car and is soon going to give the trade a sensation. Two cars are under construction, it is said. One of them is an experimental passenger car and another is a racer designed to make its debut in the coming Indianapolis races. This car is just about complete and will be entered under the name of a well-known racing enthusiast who will also enter two other powerful machines.

The Lincoln Motor Car Co., owned by Wilfred and Henry Leeland, is getting ready to enter the passenger car field. This company is building up its sales and advertising force, but details of the proposed car are being kept in the dark. It will be a 6-cylinder machine to sell at a popular price and will make its appearance in mid-summer, it is said.

There is quite a labor organization movement in Detroit. While labor was always strongly organized here, this spring is witnessing the birth of more union organizations than usual. The movement is spreading more rapidly in the factories themselves, where the different trades of individual plants are forming their own organizations. The machinists at Dodge Brothers, for instance, have their own organization now, and this same trade is also organizing in other plants.

The greatest movement, however, is the formation of the Automobile Workers' Union, designed to take all men and women engaged in any department of the automobile manufacturing business. This organization is growing rapidly and is conducting extensive membership campaigns.

There is also a movement on foot for a 6-hour working day. This movement is springing from an unknown source. The American Federation of Labor, which maintains headquarters in Detroit, knows little of the 6-hour question, and it is apparent that it is not being pushed by that organization. It is said that the 6-hour plan is being tested in several local factories, but an exhaustive inquiry fails to locate these factories. It is denied that 6-hour shifts are in operation at the Ford Motor Co., although rumors to that effect persist in gaining circulation.

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France Has 220,000 Vehicles

PARIS, March 22—At the beginning of 1917 France possessed 98,534 privately owned automobiles exclusive of trucks, taxicabs, motorbuses and motorcycles. In 1914 the number of privately owned automobiles was 115,906. The decrease of 7372 is explained by requisitions made by the army, particularly during the first six months of the war. While the official figures show the number of automobiles in France to be 98,534, this is far from being the total. These returns are based on taxation. Cars which do not pay direct taxes are not included. Thus there is no official record covering the number of trucks, taxicabs, motorcycles, etc.

As the army possesses 95,000 automobiles, and as there are about 15,000 privately owned trucks in service and probably 5000 motorcycles, the total number of motor vehicles in France is about 220,000. The Department of France, which heads the list, is the Seine district, including Paris, where there are in service 15,818 privately owned automobiles. The lowest number is found in the High Alps Department, where there are only 74 automobiles.

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Shipments to A. E. F. Decreased

WASHINGTON, April 7—A noticeable decrease in the shipments of engines and spare parts is displayed in figures made public to-day by the War Department, by which it is shown that 6 per cent of the tonnage of motors and spare parts were shipped in the first 20 days of March, 1919, as compared with 100 per cent of the tonnage shipped in October, 1918. Shipments of fuel, oils and

greases have likewise decreased. Following are the figures showing the tonnage shipments by months, as compared with the October shipments, estimating October at 100 per cent:

	Fuel, Oils and Greases	Engines and Spare Parts
November	171	99
December	159	49
January	132	9
February	148	12
March	113	6

Army to Have 1050 Tanks

WASHINGTON, April 7—Preliminary plans for the future United States Army provide for maintenance of a minimum of 1050 tanks, 330 to be of a heavy and 720 of a light type. Arrangements provide for 45 fighting tanks to a battalion, with 24 in reserve, and 45 to a light battalion, with 27 in reserve. The tanks which have already been manufactured and used, the 2-ton and the 35-ton, will be continued as the light and heavy types, the 35-ton being equipped with Liberty engines carrying a 37-millimeter cannon on each.

Lieutenant Vrooman Vindicated

WASHINGTON, April 5—Lieut. S. B. Vrooman, charged in the Hughes aircraft investigation report with violation of the statute prohibiting persons acting for the Government from tansacting business with a corporation in which they are interested, was vindicated of the charge yesterday by Attorney-General Palmer.

Testimony taken since the publication of the report, said the attorney-general's announcement, showed that all lumber for airplane propellers purchased by the Government from the S. B. Vrooman Co., Philadelphia, in which Lieutenant Vrooman was financially interested, was inspected by agents of the National Hardwood Lumber Association and not by the officer or others appointed by him. This information, the attorney-general held, constituted a complete vindication of the officer.

Liberty Airplane Engines Contracts Completed

WASHINGTON, April 7—All contracts for Liberty 12 engines were completed when the Packard Motor Car Co. made final deliveries on its contracts on March 21. A total of 20,478 engines were delivered to the Government by all the different companies from which they had been ordered, as follows:

Firm	Number Produced	Percent of Total
Packard Motor Car Co.	6,500	32
Lincoln Motor Co.	6,500	32
Ford Motor Co.	3,950	19
General Motors Co.	2,528	12
Nordyke-Marmon Co.	1,000	5
Totals	20,478	100

Restrictions on Ferromanganese Import Lifted

WASHINGTON, April 7—All restrictions on ferromanganese and spiegeleisen have been removed by the War Trade Board. Licenses will be issued freely.

Aircraft Production Board Dissolved

President Wilson Abolishes Bureau Formerly Headed by Howard Coffin

WASHINGTON, April 7—The Aircraft Production Board, of which Howard E. Coffin was chairman during the early part of the war, and about which centered the storm of "protests" from Congress, has been formally dissolved by President Wilson. A director of aircraft production will be appointed to work under Major General C. T. Menoher, in charge of production. Following is the complete executive order, signed Woodrow Wilson:

EXECUTIVE ORDER

By virtue of the authority in me vested as Commander in Chief of the Army, and by virtue of further authority upon me specifically conferred by "An Act authorizing the President to co-ordinate or consolidate executive bureaus, agencies and offices, and for other purposes, in the interest of economy and the more efficient concentration of the Government," approved May 20, 1918, I do hereby make and publish the following order:

I

The Aircraft Board, created by Act of Congress, approved October 1, 1917, having accomplished the important purposes for which it was created, is hereby dissolved.

The last paragraph of Section 3, Article 1, of the Executive Order of May 20, 1918, is hereby revoked and the following paragraph substituted therefor:

"A director of Aircraft Production, selected and designated by the Secretary of War, shall hereafter have direct charge, under the direction of the Director of Air Service, of the Bureau of Aircraft Production and he shall perform such duties in connection with the activities, personnel and properties of said Bureau as may, from time to time, be assigned him by the said Director of Air Service, or as may be prescribed by law."

II

All unexpended funds of appropriations heretofore made for the Signal Corps of the Army and already specifically allotted for use in connection with the functions of the Aviation Section of the Signal Corps and specifically placed under the jurisdiction of the Director of Military Aeronautics, as well as all such funds already specifically allotted for use in connection with the functions bestowed upon the Bureau of Aircraft Production and specifically placed under the jurisdiction of the Director of Aircraft Production are hereby transferred to and placed under the jurisdiction of the Director of Air Service for the purpose of meeting the obligations and expenditures authorized by law or Executive Order in the field of activity of the Aviation Section of the Signal Corps and the obligations and expenditures authorized by the Bureau of Aircraft Production.

Crow-Elkhart Personnel

ELKHART, IND., April 7—The personnel of the reorganized Crow-Elkhart Motor Co. is as follows: President, M. E. Crow; first vice-president, E. C. Crow; vice-president and general manager, M. E. Hoshaw; secretary, D. C. Thomas; treasurer, Henry Lichtig; vice-president and purchasing agent, H. B. Schmid. The officers, with S. H. Penfield, vice-president of the Salisbury Wheel & Axle Co., Peru Auto Parts Co. and Norwalk Auto Parts Co., and also identified with a number of other parts manufacturing concerns, comprises the board of directors. The St. Joseph Valley Bank of Elkhart has been appointed trustee for the note holders. The company expects to gradually build up the production to 15 cars a day within the next 60 days. Orders are booked at the present time for the first 60 days production.

Fordson Dealers' Convention

CHICAGO, April 8—The Rue Motor Co., Fordson representative in this territory, has formed a plan whereby dealers are to carry in stock a sufficiently large stock of parts to insure immediate replacements and, if necessary, will replace the entire tractor while the damaged one is being repaired. This was announced at the Fordson dealers' convention this week. More than 200 dealers attended the convention, which was addressed by A. E. Hildebrandt, president of the Tractor Distributers' Association of the United States, who spoke on power farming requirements. John Fletcher, vice-president of the Fort Dearborn National Bank, addressed the meeting on "Farming from the Bankers' Viewpoint."

Braddon Motors Company Gets Factory

CHICAGO, April 7—The Braddon Motors Co., a new concern involving Chicago capital, has been organized to build a small 4-cylinder car, and has secured a factory building at Downer's Grove, Ill. The moving spirit in the organization is George J. Fogle, vice-president and general sales manager, formerly with the Locomobile company and more recently with the Maibohm company at Milwaukee. Other officers are: President, F. J. Clark; secretary-treasurer, John Voiral. The company is capitalized at $50,000. Production at the rate of four cars per day will begin within the month. The car will be assembled from standard units, but painting and trimming will be done at the factory. The factory building is a two-story brick structure 50 x 100 ft.

Chair Factory Becomes Auto Body Plant

PORTLAND, MICH., April 5—The Ramsey-Alton Mfg. Co., which was a chair factory before the war, a wagon parts plant during the war, is now going to engage in the manufacture of bodies for motor trucks. The company has received its settlement on government contracts. Nearly $250,000 was spent in changing the plant from chair manufacture to war work. The company has not yet decided whether it will continue chair manufacture as an additional department or devote its entire time to the automotive business.

American Pressed Radiator Corp. Elects

DETROIT, April 5—The American Pressed Radiator Corp. has elected the following officers for the coming year: President, C. H. O. Meyer; vice-president, R. S. Drummond; secretary, John S. Irwin; treasurer, H. F. Hiney. Mr. Drummond was formerly vice-president and general manager of the Detroit Steel Products Co., and Mr. Hiney was associated with him at that plant.

Hayes Wheels for Trucks and Tractors

JACKSON, MICH., April 9—The Hayes Wheel Co., which has made wood wheels for passenger cars ever since the industry was established, is now launching into the business of supplying wheels for trucks and tractors, and has established a new branch in the plant of the Jackson Munitions Corp., which it has leased and will probably purchase. A large number of men are already employed in the munitions plant, and as fast as Government-owned machinery used for munitions work is removed by the Government machinery for making steel wheels and metal parts is being installed.

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New Wilson Body Building Soon Ready

DETROIT, April 9—The new press and die department of the C. R. Wilson Body Co. will be completed within 60 days. This will add 200,000 sq. ft. to the company's plants. These additional facilities will enable the company to produce more than 1000 bodies per day.

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Panzardi & Co. New Porto Rican Dealers

PONCE, P. R., April 9—Santiago A. Panzardi & Co. have been organized to buy and sell motor vehicles and accessories and will have the agencies for the following cars: White, Packard, Premier, Hudson Super-Six, Buick, Chevrolet and Essex, Indian motorcycles and Tilene greases. The firm is made up of Santiago A. Panzardi, Juan E. Villeta, Jaime Oppenheimer and Jorge Oppenheimer. Messrs. Villeta and J. Oppenheimer will have direct charge of the business, and besides the store here at Calle Isabel, corner of Leon, it will open agencies at Juana Diaz, Coamo, Barros, Santa Isabel, Adjuntos, Ponuelas, Guanica, Yauco and Guayanilla.

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J. E. F. Spark Plug Putting Up Factory

MILWAUKEE, April 9—The J. E. F. Spark Plug Co. has completed plans for the erection and equipment of a plant at 37th Street and Hillside Lane. Work will begin at once on a one-story factory, 50 x 156 ft., of reinforced concrete and brick, designed to receive additions and extensions as necessary. The investment in building and equipment will be about $25,000.

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Metal Products Sales Co. Organizes

DETROIT, April 9—The Metal Products Sales Co., formed by A. F. Stengle and F. B. Breakey, will act as direct factory representatives for the Globe Machine & Stamping Co., Cleveland; Standard Foundry Co., Buffalo; Springfield Malleable Iron Co., Springfield, O.; Enterprise Mfg. Co., Akron, O.; Maynard Electric Steel Casting Co., Milwaukee, and the Barnett Drop Forge Co., East Hampton, Mass.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Advance-Rumely $1,338,586 Ahead This Year

LA PORTE, IND., April 7—Showing net profits and income for the year of $1,188,928, as compared with $550,557 for 1917, the annual report of the Advance-Rumely Thresher for the year ended Dec. 31, 1918, reports a prosperous condition of the company. The gross profits from operations are $3,073,877, compared with $2,101,832 in 1917. Various items added to the above make a total profit and income for the year of $3,393,703. Net profits amount to $1,338,586, against $715,758 in 1917.

The report shows that during the year there was spent in La Porte for machinery, equipment and warehouses $237,332, and for similar purposes in Battle Creek $298,011. The plants here are running at practically capacity, while at Battle Creek the number of employees has been increased from 407 to 1415. The company subscribed for $2,000,000 in Liberty Bonds and purchased $366,320 for its employees, sold to them on instalment plan. It also bought $750,000 worth of U. S. certificates of indebtedness and $100,000 worth of Canadian Victory Bonds. During the year 376 of its employees entered military service. The debenture debt of the company was materially reduced. Reserves set aside amount to $876,065.

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American Bosch Adds to Staff

SPRINGFIELD, MASS., April 7—Additions and changes have taken place in the staff of the American Bosch Magneto Corp. W. G. Brown has been transferred from the New York office to become branch manager of the Chicago branch. T. C. Miller, formerly assistant manager at Detroit, assumes the position of branch manager at New York. Harold A. Wilson, formerly of the Diamond State Fibre Co., has joined the organization as assistant branch manager at Chicago. A. C. Hyser, who was in charge of the service department of the Willard Storage Battery Co., goes to Detroit to succeed T. C. Miller, and Oliver S. Stanley, who has been the assistant manager of the St. George Paper Co., Norwalk, Conn., has become assistant manager at New York.

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Glidden Co. Buys Pennsylvania Plant

CLEVELAND, April 5—The Glidden Co., manufacturer of paints, varnishes, acids and chemicals, has taken over the A. Wilhelm Co., Reading, Pa., and will continue the business as heretofore. Besides its factories in Cleveland, San Francisco and Toronto, it now has manufacturing facilities in the east.

Olds Up 40 Per Cent in Production

LANSING, April 9—Truck production at the Olds Motor Works is reaching quantity figures. Although this company went into truck manufacture only 2 months ago, that division of operation is now in full swing, 30 machines of the ¾-ton type being completed daily. Passenger car production is now at the 140 daily mark. This is an increase of 40 per cent over February figures.

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Work on Olds Plant Expansion

LANSING, MICH, April 9—Work on one of the largest of the buildings to be included in the Olds Motor Works expansion program has begun on the Reliance Engine Co. property. This structure will be 700 x 240, and will be used to house the axle department of the plant. It is estimated that the expansion plans of the Olds company, which will be carried out this spring and summer, mean an expenditure of between $1,000,000 and $1,500,000. A new administration building is among the structures in prospect.

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Ford Street Car Coming Next

DETROIT, April 4—Henry Ford and the engineers of his tractor organization are working on plans for a street car driven by an internal combustion engine, which will be demonstrated in Detroit this summer, according to Charles E. Sorensen, general manager of the Henry Ford & Son tractor plant.

Lieut.-Col. E. J. Hall, one of the designers of the Liberty engine, will come to Detroit to assist in the demonstration of the new car. He has already successfully worked out engine-driven street cars, but will co-operate with Mr. Ford in perfecting the latter's new idea.

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Samson Plans 30 Tractors Daily

DETROIT, April 4—It is stated at the General Motors Corp. headquarters here that the Samson Tractor Co., Janesville, Wis., will begin operations in three weeks, and that by July 1 approximately 1850 Model M tractors will have been completed and shipped. It is expected that by that time the company will be producing 30 machines daily.

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Hudson Doubles Car Production

DETROIT, April 5—The Hudson Motor Car Co. launched into its second quarter production Monday by doubling its output of both Hudson and Essex cars. From 2500 machines of each make last month this company jumps to 3750 production basis, and hopes to turn out 7500 jobs of both makes in April.

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New Spring Factory for Standard Parts

CLEVELAND, April 7—A new spring factory is under construction for the Standard Parts Co. at Flint. It will replace the company's present Flint plant, long since outgrown. The new factory will have an immediate capacity four times greater than that of the old plant.

Barnes Gives Up Management of Parrett Tractor

CHICAGO, April 8—Claire L. Barnes has resigned as vice-president and general manager of the Parrett Tractor Co. He was instrumental in the reorganization of the company a year ago, and at that time took over the management of the company's affairs. Feeling that his work has now been completed, he has resigned to devote his time to the development of other interests. Mr. Barnes is a well known figure in the industry, having been for years associated with John N. Willys in the management of the Willys-Overland properties. Management of Parrett production will be under an executive committee of three under the chairmanship of President Dent Parrett, who recently retired from the service as a captain in the Ordnance Department.

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LeRoy A. Hillman will be in charge of the branch of the Detroit Pressed Steel Co., which has been opened here for Disteel wheels. Mr. Hillman has been in civilian service with the Bureau of Aircraft Production, and before that operated The Bearings Shop, interest in which he still retains.

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P. S. Russell, formerly general sales manager for the Hale & Kilburn Corp., Philadelphia, has recently been released from the army and has been appointed manager of the new Packard Motor Car Co.'s branch at St. Louis.

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Harry M. Gardiner, General Motors Corp., has been appointed successor to H. J. Sproat, works manager of the Olds Motor Works, Lansing.

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A. J. Wise, formerly with the F. B. Stearns Co., Cleveland, and later with the New York branch of the Paige-Detroit Motor Car Co., has been made manager of that organization.

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Brockholst Mathewson has been placed in charge of the Detroit office of the Savage Arms Corp., which has recently been opened at 1408 Kresge Building.

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Clifford A. Williams, director of sales of the Kissel Motor Car Co., Hartford, Wis., has resigned, to take effect April 15. He is to become vice-president of the Western Motor Co., new distributers of Kissel products in California and Arizona. This organization is headed by Cuyler Lee, former Packard distributer.

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George Hills, manager of factory sales of the American Rolling Mill Co., has resigned to accept the general management of the Ohio General Tractor Co., Cleveland.

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Wm. R. Blackburn, formerly factory manager of the Cadillac Motor Car Co., Detroit, has assumed the position of manager of the Gray Motor Co., Detroit. He was connected with the Cadillac company for twelve years.

Men of the Industry

Changes in Personnel and Position

Amel R. Carlson, who has completed his government service on the purchasing staff of the Wright-Martin Aircraft Corp., New Brunswick, N. J., has returned as assistant general manager to the Commonwealth Motors Co., Chicago.

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Harold C. Bement has been placed in charge of the electric furnaces at the new plant of the Onondaga Steel Co., Inc., Eastwood, N. Y. He was formerly melter foreman at the government arsenal at Watertown, Mass.

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M. W. Bartlett, for the past five years secretary of the Splitdorf Electrical Co., has joined the Wire Wheel Corp. of America as Eastern District representative, with headquarters in New York at 835 Eleventh Avenue. Service direction and export matters are also under his supervision.

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J. D. Mooney, recently discharged from his military duties as captain with the 309th Ammunition Train, has gone with the General Motors Corp., New York. He was manager of the Hyatt Roller Bearing Co.'s Industrial Division prior to joining the army in 1917.

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Clark W. Upp has been appointed special foreign representative of the Federal Motor Truck Co. to cover the West Indies, South and Central America and Mexico.

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F. M. House, who has been with the Republic Motor Truck Co. for many years, has been appointed manager of the Pacific coast sales division of that company.

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W. G. Langdon, who has been with the Willys-Overland Co. for some time, has been made assistant general purchasing agent of that company. He was formerly connected with the Michigan Stove Works and later with the Hayes Manufacturing Co.

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W. L. Mahon, who has been with the General Motors Truck Co., Pontiac, for some time, has been made manager of a new department of the sales division of that company. He will have charge of research and statistics and will prepare data on motor truck operation for G. M. C. owners.

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Paul Welhener, who comes to the motor truck field from the farm implement business, has joined the factory sales department of the General Motors Truck Co, Pontiac.

Yoder Becomes Secretary of Federal Trade Commission

WASHINGTON, April 5—J. P. Yoder, formerly special examiner of the Federal Trade Commission, has been made secretary of the commission to succeed Leonidas L. Bracken, who resigned recently. Mr. Yoder left the commission in February, 1918, to serve as a captain in the Army Sanitary Corps, and has recently returned from service in France.

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S. Bloom has been appointed director of the Essenkay Products Co., Chicago. For the past year he has been in military service, and previous to that was in the advertising business both in America and Australia.

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H. W. Meyer of the Ajax Auto & Aero Sheet Metal Co. has turned over his plant and machinery to the Ajax Auto & Aero Sheet Metal Co., Inc.

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Milton W. Franklin, consulting electrical engineer, has been engaged by the Remy Electric Co., Anderson, Ind. Mr. Franklin has written articles for technical publications. He was formerly connected with the General Electric Co. and was president and general manager of the C. & C. Electric Mfg. Co., Garwood, N. J.

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W. F. McLaughlin has been appointed factory superintendent of the Hyatt bearings division of the General Motors Corp. at Harrison, N. J.

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C. P. Cary, who has been manager of the New England branch of the Garford Motor Truck Co. for several years, coming here from San Francisco, has resigned and is now in charge of the truck department of Alvan T. Fuller's agency for Packards.

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George B. Chapman, who came to Boston from the Federal Truck Co., Detroit, to manage the agency placed by that company for New England, has resigned to succeed C. P. Cary as manager of the New England branch of the Garford Motor Truck Co. The position of manager of the Federal agency will be filled by C. E. Whitten, Jr., Lynn, whose father controls the Federal business in Boston and vicinity.

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L. S. Chamberlain, formerly manager of the San Diego branch of the Savage Tire Corp., has been promoted to the position of assistant sales manager, with headquarters at the factory. H. E. Cressler, until recently with the Goodrich Tire & Rubber Co., succeeds him as branch manager.

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Frank M. Comrie and **Wm. J. Cleary** have resigned from the Thielicke Advertising Co. to go into business for themselves as Comrie & Cleary, Inc., with offices at 1512 American Building, Chicago. Mr. Comrie is president of the new company, Mr. Cleary treasurer and general manager, and with E. J. Phillips and J. M. Rosser, constitute the board of directors.

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:

Muriatic, lb.	.02 -.03
Phosphoric (85%), lb.	.35 -.39
Sulphuric (60%), lb.	.008

Aluminum:

Ingot, lb.	.29 -.31
Sheets (18 gage or more), lb.	.42
Antimony, lb.	.06½-.06⅞

Burlap:

8 oz., yd.	.06¼
10½ oz., yd.	.08½

Copper:

Elec., lb.	.15½
Lake, lb.	.15¾

Fabric, Tire (17¼ oz.):

Sea Is., combed, sq. yd.	1.40
Egypt, combed, sq. yd.	1.25
Egypt, carded, sq. yd.	1.20
Peelers, combed, sq. yd.	1.10
Peelers, carded, sq. yd.	.85

Fibre (⅛ in. sheet base), lb. .50

Graphite:

Ceylon, lb.	.09 -.22
Madagascar, lb.	.10 -.15
Mexico, lb.	.03¾

Lead, lb. .05 -.05¼

Leather:

Hides, lb.	.24 -.39½

Nickel, lb. .40

Oil:

Gasoline:	
Auto, gal.	.24½
68 to 70 gal.	.30½
Lard:	
Prime City, gal.	2.45 -2.50
Ex. No. 1, gal.	1.15 -1.20
Linseed, gal.	1.45 -1.48
Petroleum (crude):	
Kansas, bbl.	2.25
Pennsylva'a, bbl.	4.00
Menhaden (dark), gal.	.95

Rubber:

Plantation:

First latex pale crepe, lb.	.48½-.49
Brown crepe, thin, clear, lb.	.44
Smoked, ribbed sheets, lb.	.47½

Para:

Up River, fine, lb.	.56
Up River, coarse, lb.	.34
Island, fine, lb.	.47½

Shellac (orange), lb. .60 -.64

Spelter, lb. .06¼-.06⅛

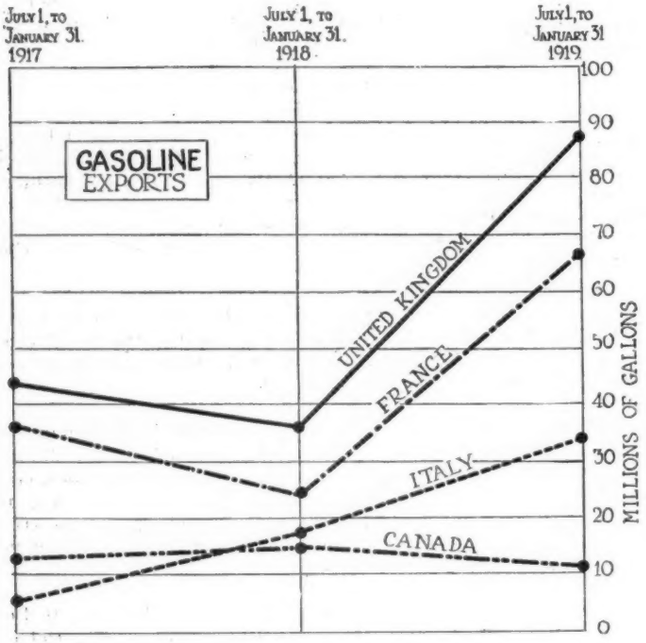
Steel:

Angle beams and channels, lb.	.03
Automobile sheet (see sp. table).	
Cold rolled, lb.	.0625
Hot rolled, lb.	.039

Tin .71 -.72

Tungsten, lb. 1.50 -2.10

Waste (cotton), lb. .12¾-.17



Showing the enormous demand made by the Allies for gasoline for war purposes during 1918

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock	$5.95	$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.

Blank Sheet Extras to Apply to Narrow Widths:
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.

Automative Securities on the Chicago Exchange at Close of April 5

	Bid	Asked	Net Ch'ge
Auto Body Company	9	10	+1
Briscoe Motor Car com.	13	..	..
Briscoe Motor Car pfd.	50	65	..
•Chandler Motor Car	126	128	+1¼
Chevrolet Motor Car	189	191	..
Cole Motor Car Co.	93	105	..
Continental Motors com.	7¾	8¼	+⅛
Continental Motors pfd.	98	101	..
Edmunds & Jones com.	15	20	..
Edmunds & Jones pfd.	75	90	..
Electric Storage Bat.	69	71	..
Federal Motor Truck	34	36	..
Fisher Body Co. com.	56	58	+1
Fisher Body Co. pfd.	92	94	—3
Ford Motor of Canada	285	295	..
General Motors com.	170¼	171½	—¼
General Motors pfd.	89¾	91¾	+¼
Hupp Motor Car com.	7¾	8¼	—⅝
Hupp Motor Car pfd.	96	100	+1
Kelsey Wheel Co. com.	35	37	—2
Kelsey Wheel Co. pfd.	93	95	—1
Manhattan Electric S. com.	..	48	..
Maxwell Motor com.	36¾	37¾	—2⅛
Maxwell Motor 1st pfd.	65	66	—2½
Maxwell Motor 2nd pfd.	30½	31½	—1
McCord Mfg. com.	32	35	—1
McCord Mfg. pfd.	91	93¼	..
Mitchell Motors Co.	27	31	..

	Bid	Asked	Net Ch'ge
Motor Products Corp.	..	35	..
Nash Motors Co. com.	230	250	..
Nash Motors Co. pfd.	95	100	..
National Motor Co.	15	20	..
Packard Motor Car com.	120	123	+5
Packard Motor Car pfd.	99	101	..
Paige-Detroit Motor com.	28½	29½	+½
Paige-Detroit Motor pfd.	8¾	9¾	..
Peerless Motor Truck	21	23	—1
Pierce-Arrow M. Car. com.	45¾	46¾	+½
Pierce-Arrow M. Car pfd.	102	104	..
Premier Motor Corp. com.	5	..	..
Premier Motor Corp. pfd.	..	75	..
Prudden Wheel Company.	18	19	..
Reo Motor Car Co.	23½	24¼	..
Republic M. Truck com.	39½	41	+3½
Republic M. Truck pfd.	91	95	..
Saxon Motor Car com.	6½	8½	..
Scripps-Booth Corp.	21	25	..
Stewart Warner S. Corp.	89½	91½	+¼
Stromberg Carburetor Co.	38	40	..
Studebaker Corp. com.	64⅜	65⅜	+⅝
Studebaker Corp. pfd.	94	97	..
*Stutz Motor Car Co.	50⅝	51⅝	+⅛
United Motors Corp.	45	47	+1½
White Motor Co.	54¼	55¼	+1½
Willys-Overland com.	28⅝	29⅝	—¾
Willys-Overland pfd.	92	93	..

RUBBER STOCKS

	Bid	Asked	Net Ch'ge
Ajax Rubber Co.	74½	75½	+3
Firestone T. & R. com.	147	150	..
Firestone T. & R. pfd.	101	102	+1½
Fisk Rubber Co. com.	108	111	+5
Fisk Rubber 1st pfd.	100	105	..
Fisk Rubber 2nd pfd.	107	110	+6
Fisk Rubber 1st pfd. conv.	99	101	..
Goodrich, B. F., com.	65¼	66¼	—1¼
Goodrich, B. F., pfd.	106½	107½	..
Goodyear T. & R. com.	270	275	..
Goodyear T. & R. 1st pfd.	105½	107	—½
Goodyear T. & R. 2nd pfd.	106½	108½	+¼
Kelly Springfield com.	118½	119½	—1
Kelly Springfield 1 pfd.	95	97	..
Lee Tire & Rubber Co.	25	26	+1
Marathon Tire & Rubber	52	70	—3
Miller Rubber Co. com.	175	178	..
Miller Rubber Co. pfd.	102	103	+½
Rubber Products Co.	129	133	—4
Portage Rubber Co. com.	158	162	—5
Swinehart T. & R. Co.	80	84	..
U. S. Rubber Co. com.	83½	84½	+¼
*U. S. Rubber Co. pfd.	111¼	112¼	+½

*Ex dividend.

Collision Abandonment Insurance Now Available

KANSAS CITY, April 9—A new kind of insurance, which provides payment by the insurance company of the unpaid notes held by dealers when a car or truck is damaged by collision and abandoned by its purchaser, is being written by the Employers Indemnity Corp.

This insurance is paid for by the purchaser when he buys the car, the charge being included among the other various items involved in arranging for the time sale. The dealer usually requires that the purchaser take out fire and theft insurance and some other coverages.

The new insurance protects the interests of the dealer (or of the banker or other person who may hold the notes). The policy costs $5 to $15, depending on the list price of the car. The purchaser has no interest in the indemnity. The policy explicitly guarantees to the dealer or holder of the notes that in case the car is damaged and abandoned the insurance company will take up the unpaid notes. The company is given possession of the car and takes its chances on salvage.

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Natl. Welding Assn. Organized

NEW YORK, April 9—The American Welding Society was formed at a meeting March 28 at the Engineering Societies Building. C. A. Adams, Cambridge, Mass., was elected president. Other officers elected were: Vice-president (1 year), J. M. Morehead, New York; vice-president (2 years), G. L. Brunner, Utica, N. Y.; treasurer, W. E. Symons; secretary, H. C. Forbes; directors (1 year), W. M. Beard, New York; M. H. Roberts, New York; M. M. Smith, New York; L. D. Lovekin, Philadelphia; Alexander Churchward, New York; W. H. Patterson, Pittsburgh; Walter J. Jones, Philadelphia; C. A. McCune, New York. Directors (2 years): R. R. Browning, New York; A. S. Kinsey, Jersey City; Victor Mauck, Conshohocken, Pa.; E. L. Hirt, South Bethlehem; J. F. Lincoln, Cleveland; H. M. Hobart, Schenectady, N. Y.; D. C. Alexander, New York; H. R. Swartley, Jr., Jersey City. Directors (3 years): L. H. Davis, New York; E. L. Mills, New York; D. B. Rushmore, Schenectady; James Burke, Erie; D. H. Wilson, Jr., New York; Herman Lemp, Erie; C. J. Nyquist, Chicago; Alexander Jenkins, Baltimore. The society is a merger of the welding committee of the Emergency Fleet Corp. and the National Welding Council.

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Decline in Malay Rubber Exports

WASHINGTON, April 9—Rubber exports from the Federated Malay States and Straits Settlements declined in 1918 to 140,631 tons as compared with shipments of 152,923 in 1917. This was due to the lack of cargo space and to the American restrictions on imports. Many of the rubber companies in Malaya voluntarily restricted their tapping operations, but notwithstanding there was a considerable amount of rubber stored at Singapore at the close of 1918. Following are the export figures for the past three years:

	Federated Malay States			Straits Settlements		
	1916 Tons	1917 Tons	1918 Tons	1916 Tons	1917 Tons	1918 Tons
Jan. ...	4,471	5,995	7,588	4,443	3,562	4,302
Feb. ...	5,207	7,250	6,820	3,359	6,495	2,334
Mar. ...	4,429	7,088	7,709	4,481	8,299	8.858
April ..	3,914	5,955	7,428	4,219	6,103	6,584
May ...	3,956	7,179	5,881	3,274	6,282	13,587
June ..	5,114	6,009	5,161	3,836	8,775	6,515
July ..	5,053	5,798	5,706	5,106	7,351	1,978
Aug. ..	5,782	6,487	5,291	3,246	3,786	1,249
Sept. ..	6,376	7,087	6,588	2,987	5,679	6,209
Oct. ...	5,968	7,079	5,901	5,233	4,702	3,260
Nov. ...	6,776	6,180	7,097	5,247	5,555	2,661
Dec. ...	5,718	7,724	7,085	3,219	6,503	4,839
Total	62,764	79,831	78,255	48,650	73,092	62,376

The Straits Settlements' totals include transshipments amounting to 7416 tons in 1917 and 4447 tons in 1918.

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Goodrich-Lenhart Moves to New Factory

HAMBURG, PA., April 7—The general office of the Goodrich-Lenhart Mfg. Co. has been moved here, where the company has recently completed a new factory building. A sales office will be maintained in the Widener Building, Philadelphia, where it has been located for the past three years.

Chamber Recommends Repeal of Anti-Trust Law

WASHINGTON, April 4—Reconsideration by Congress of all anti-trust legislation is recommended by American industry as the result of a referendum vote of the business interests of the country represented in trade and commercial organizations, instituted by the Chamber of Commerce of the United States. Complete returns from the referendum, made public to-day, show that the constituent membership of the chamber voted in favor of all four proposals advanced by a special committee which has studied the subject.

The proposals and the vote follow:

Congress should be asked immediately to consider the present situation of all statutes constituting our anti-trust legislation—for, 1543; against, 51.

In reconsideration of existing anti-trust legislation there should be formulation of standards of general business conduct to be administered by a supervisory body—for, 1159; against, 389.

An enlarged Federal Trade Commission should be made the supervisory body—for, 1102; against, 437.

In view of the importance of the functions of the Trade Commission as they would exist the membership of the Federal Trade Commission should be increased to nine—for, 1104; against, 422.

The committee's report and the results of the vote are significant in view of the fact that the subject of anti-trust legislation will be taken up at the seventh annual meeting of the chamber to be held at St. Louis April 28 to May 1.

In requesting a vote on this legislation, the chamber pointed out that there were several hundred proceedings against great industrial concerns based on the Sherman act, and that frequent interpretations of the law had made it almost impossible for a manufacturer to know when he was violating it. It further pointed out the discouragement to business enterprise created by the act. Suggestion for the continuation and enlargement of the Federal Trade Commission was made because the commission has obtained a mass of information about American industry and commerce.

An English type of farm tractor exhibited at the Lyons Fair in France. It is the Alldays & Onions machine

Calendar

ENGINEERING

SHOWS

April 5-12 — Bridgeton, N. J. Fourth Annual, Automobile Dealers' Assn.

April 5-12—Montreal, Can.—National Motor Show of Eastern Canada, Victoria Rink. T. C. Kirby, Manager.

April 8-12—Deadwood, S. D. Seventh Annual. Cars and Tractors, Deadwood Business Club.

April 16-19 — Waynesburg, Pa. Automobile Dealers' Assn. of Greene Co., Armory. Frank L. Hoover, Mgr.

May 10-17—Bristol, Va.-Tenn. Cars, Trucks, Tractors, Airplanes and Accessories. Bristol Chamber of Commerce. C. W. Roberts, Manager.

June 2-6—Hot Springs, Va. Convention, Automotive Equipment Assn., Homestead Hotel.

*Oct. 15—Paris. Grand Palais, International Automobile Mfrs. Congress.

Nov. 7-15 — London — Olympia Motor Car Exhibition—Society of Motor Mfrs. and Trades.

December—Brussels. International Automobile Mfrs. Congress.

January—New York. International Automobile Mfrs. Congress.

February — Chicago. International Automobile Mfrs. Congress.

Feb. 23-Mar. 6 — Birmingham, Eng. British Industries Fair.

TRACTOR SHOWS

April 15—Walla Walla, Wash. Sectional Tractor Demonstrations.

May 5—Sacramento, Cal. Sectional Tractor Demonstrations, Demonstration Field.

June — Denver, Col. Sectional Tractor Demonstrations.

July—Wichita, Kan., Automotive Committee of National Implement Assn.

Aug.—Aberdeen, S. D. Sectional Tractor Demonstrations.

RACES

April 24—San Bernardino, Cal. Rim of the World Hill Climb.

†May 17—Uniontown, Pa., probably 112½ miles.

†May 31—Indianapolis, Indianapolis Motor Speedway Assn., 500 miles.

*June 14—Sheepshead Bay, L. I. Speedway race.

*July 5—Cincinnati, O., Speedway.

*July 19—Uniontown, Pa. Speedway race.

*July 26—Sheepshead Bay, L. I. Speedway race.

*Aug. 15—Middletown, N. Y. Dirt track event.

*Aug. 22-23—Elgin, Ill. Road race.

*Aug. 23—Sheepshead Bay, L. I. Speedway race.

*Sept. 1—Uniontown, Pa. Speedway race.

*Sept. 20—Sheepshead Bay, L. I. Speedway race.

*Sept. 27—Allentown, Pa. Dirt track event.

*Oct. 1—Cincinnati, O. Speedway race.

*Oct. 4—Trenton, N. J. Dirt track event.

*Oct. 11—Danbury, Conn. Dirt track event.

†Sanctioned.
*Tentative dates.

CONVENTIONS

April 10-12—Philadelphia. National Assn. of Motor Truck Sales Mgrs., Bellevue-Stratford.

April 24-26—Chicago — National Foreign Trade Council. Sixth National Foreign Trade Convention. Congress Hotel.

May 1-June 1 — Atlantic City, N. J.—Pan-American Aeronautic Convention and Exhibition — Aero Club of America, the Aerial League of America and the Pan-American Aeronautic Federation.

Sept. 22-24—Philadelphia, Annual Convention, National Association of Purchasing Agents, Bellevue-Stratford.

Foreign Trade Opportunities

WASHINGTON, April 7—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has inquiries for the agencies of automobiles and accessories. Full information regarding each of the following can be secured by addressing the Bureau of Foreign and Domestic Commerce and referring to the Foreign Trade Opportunity number:

Italy — Agricultural machinery. Correspondence should be in Italian. No. 28899.

France—Heavy trucks. No. 28880.

Swedish buyer of harvesting and agricultural machinery is about to arrive in this country and desires to be placed in communication with American manufacturers and exporters. No. 28884.

France—Motor cars and accessories. Correspondence should be in French. No. 28907.

Norway—Electric touring cars (without tops), with chauffeur's seat in front, Edison batteries preferred; and rubber tires. No. 28910.

Algeria—Motor vehicles, to maintain a depot for same, and to secure an exclusive general agency for the sale in North Africa of automobiles, tractors, and other motor driven vehicles which might find ready sale in that country. It desires to establish a depot for these vehicles with all accessories, and requests catalogues and prices. No. 28912.

Scotland—Motor vehicles, principally 1-ton chassis, suitable for vans. No. 28923.

Switzerland—Industrial machinery. Correspondence should be in French. No. 28927.

Italy—Automobiles and accessories, including pneumatic tires, greases and oils for lubricating. Payment guaranteed through bank deposit. Correspondence should be in Italian. No. 28928.

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Machinists Endorse Short Hours to Reduce Labor Surplus

COLUMBUS, April 9—Delegates to the convention of the Ohio Federation of Machinists have before them for consideration resolutions indorsing a 44-hour week and if necessary a 32-hour week to give employment to the 25,000 machinists said to be out of work because of the cancellation of government contracts.

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To Popularize Magneto Ignition

NEW YORK, April 9—Five of the principal manufacturers of magnetos have banded together for the purpose of instituting a propaganda campaign to popularize the more extensive use of magnetos on various forms of automotive equipment. The association has established headquarters at 110 West Fortieth Street, New York. It includes Splitdorf Electrical Co., Newark; Bosch Magneto Co., Springfield, Mass.; Simms Magneto Co., East Orange; Eisemann Magneto Co., Brooklyn, N. Y.; Ericsson Mfg. Co., Buffalo.

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Garage Association Formed

BOSTON, April 5—The Garage Association of Metropolitan Boston has been formed with a membership comprising active and associate members of more than 500. It plans to extend its activities throughout Massachusetts first and later all over New England.

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Union Switch to Make Shafts

SWISSVALE, PA., April 5 — The Union Switch & Signal Co. has purchased machinery for finishing crankshafts and camshafts, and will be ready for delivery about June 1. It manufactures its own forgings.

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Singleton Advertising Co. New Name

CLEVELAND, April 5—The Singleton-Hunting Co., advertising agency, has changed its name to the Singleton Advertising Co. The management, personnel and financial status remain the same as before.

Dutch Rubber Activities Restricted

WASHINGTON, April 7 — Rubber trade in the Dutch rubber market has not increased during the past year, according to the annual report of the Amsterdam Association for the Rubber Trade. No rubber whatever can be distributed to factories except under strict conditions imposed by the Netherlands Oversea Trust, which permitted distribution of only 464 tons during the past year. The report states that, contrary to expectations, the rubber trade will not be able to operate without restrictions despite cessation of hostilities. The shortage of cargo space will restrict the activities of the trade for a long period.

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Greenfield's Second Show in Armory

GREENFIELD, MASS., April 7—Cars, trucks and tractors took part in the second motor show held here at the State Armory. As there were no miscellaneous accessory booths there was adequate room for the display of the vehicles. Dealers and distributers staged their own displays, which included the principal makes of motor vehicles of all kinds.

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Elgin to Build Canadian Plant

WINNIPEG, MAN., April 7 — The Elgin Motor Co. will build an assembling plant here to cost about $100,000.

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Factories Urged to Adopt Open-Air Sports

DETROIT, April 5—The Recreation Commission will hold a conference for Detroit manufacturers Thursday, April 10, to organize plant welfare workers in promotion of inter-plant athletics and recreation. The big plants will be asked to form baseball clubs, tennis clubs and clubs for other athletic games.